VOLUME XXXV NO. 181 JULY-AUGUST, 1950

ORDNANCE

☆ LAND
☆ SEA
☆ AIR

Reg. U. S. Pat. Off.

EDWARD T. GUSHEE
Chief of the Detroit Ordnance District

In This Issue

Ordnance Field Service
A special report

Cold Steel Extrusion
Col. Merle H. Davis

What about the A-Bomb?
Lowell M. Limpus

Spicer Universal Joints—

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ORDNANCE ★ LAND ★ SEA ★ AIR

The Magazine of Scientific and Industrial Preparedness

Vol. XXXV JULY-AUGUST, 1950 No. 181

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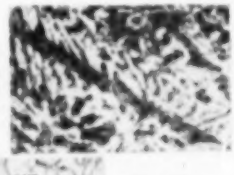
Examining specimen on metallographic microscope at Bell Telephone Laboratories

Through his microscope this Bell metallurgist examines a bit of material which is proposed for telephone use. From what he sees of grain structure, he gains insight into performance not provided by spectrum or chemical analysis. He learns how to make telephone parts stand up longer, so that telephone costs can be kept as low as possible.

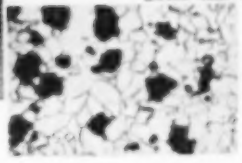
The items which come under scrutiny are many and varied, ranging from manhole covers to hair-thin wires for coils, from linemen's safety buckles to the precious metal on relay contacts.

In joints and connections—soldered or welded, brazed or riveted—photomicrographs reveal flaws which would escape ordinary tests. They show if a batch of steel has the right structure to stand up in service; why a guy wire let go in a high wind or a filament snapped in a vacuum tube; how to make switchboard plugs last longer.

In their exploration of micro-structure, Bell Telephone Laboratories scientists have contributed importantly to the metallographic art. You enjoy the benefits of their thoroughgoing testing and checking in the value and reliability of your telephone system, and the low cost of its service.



Photomicrograph of white cast iron which is hard and brittle.



Same iron rendered malleable by heat treatment. Shows spots of nodular carbon.

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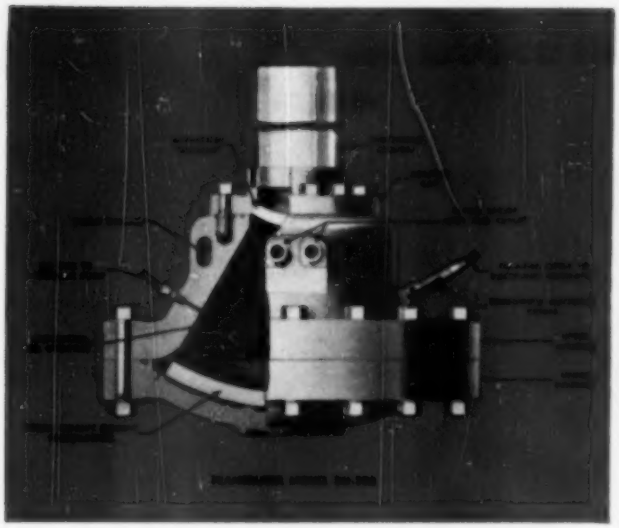
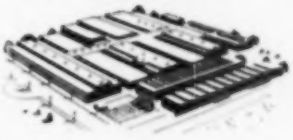


Cutaway view of the Hypersonic Transducer manufactured by The Brush Development Company which finds industry-wide application for emulsification, vaporization, homogenization and degassing of various liquids and solids.

CLEVELAND, OHIO



Sand & Permanent Mold Foundries

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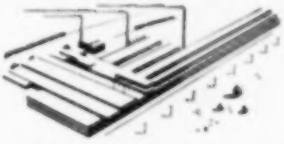

Permanent Mold Foundry

Typical of the tough ones cast by ALCOA

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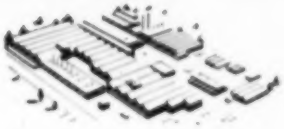
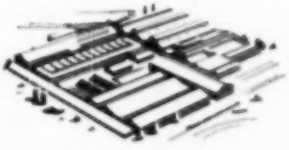
Look for Aluminum Company of America listed in your phone book under "Aluminum". Call there for a casting specialist, or write Aluminum Company of America, 1400G Gulf Building, Pittsburgh 19, Penna.

BRIDGEPORT, CONN.



Sand & Permanent Mold Foundries

LOS ANGELES, CALIF.



Sand & Permanent Mold Foundries

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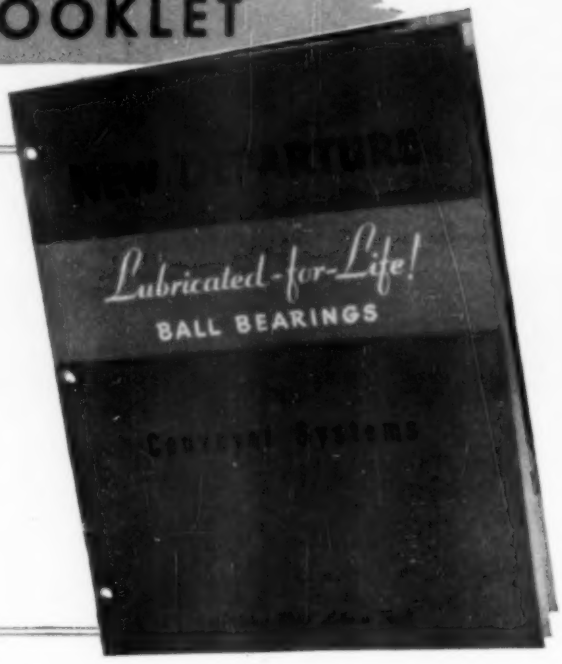

MORE THAN any other single invention perhaps, the mechanized conveyor system lifts the load off man's back and puts it on the machine.

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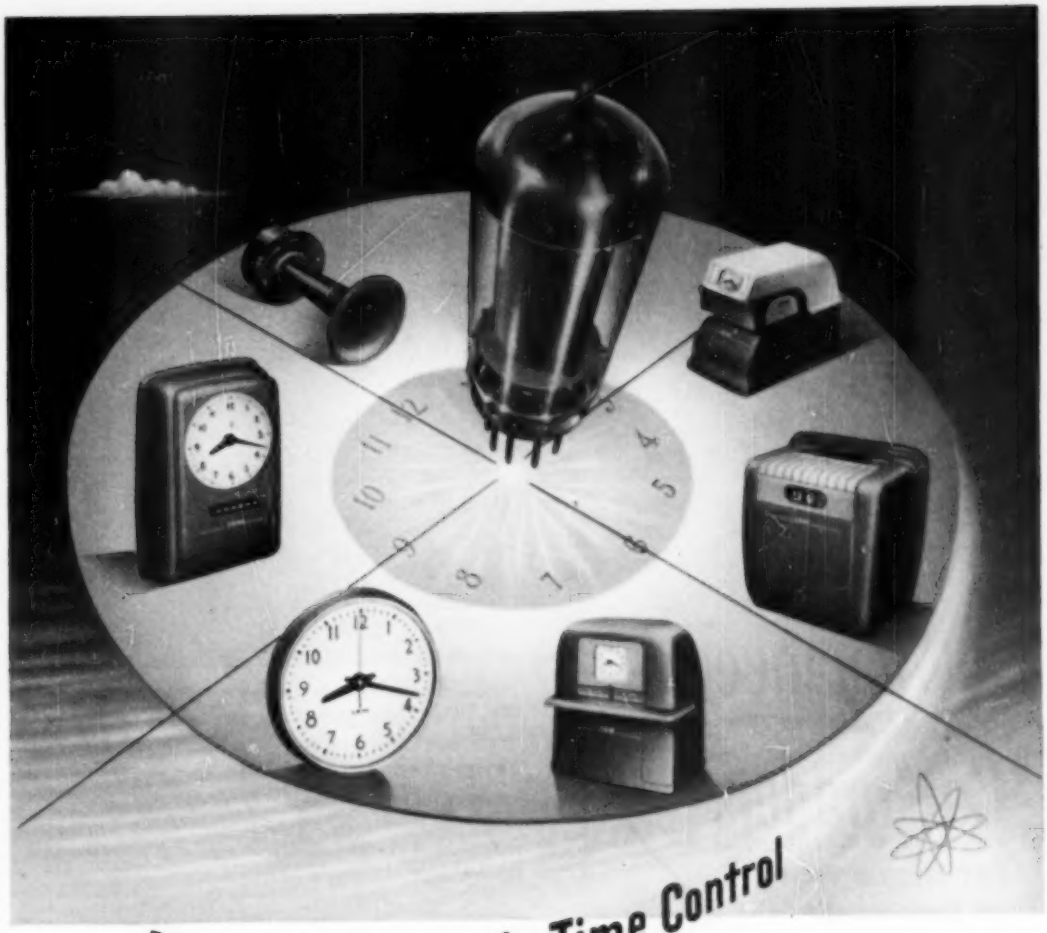

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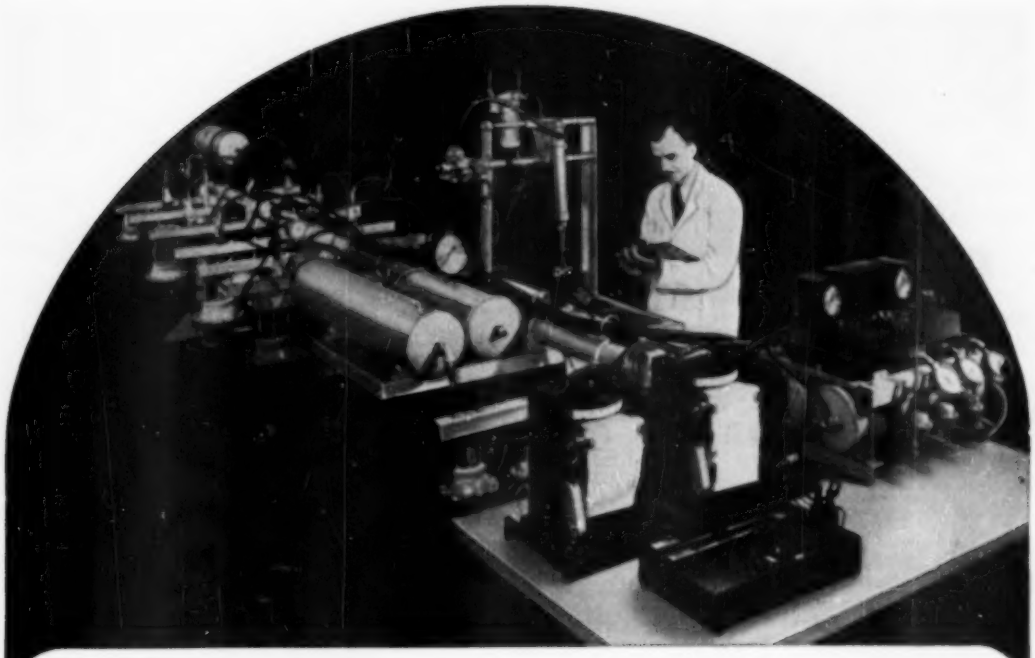

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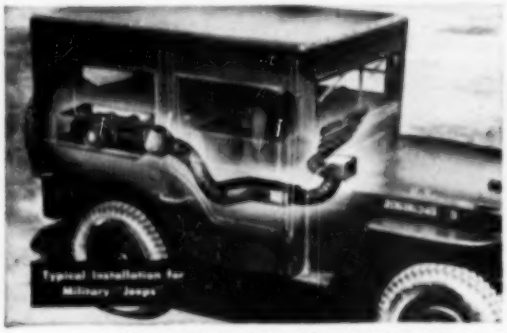
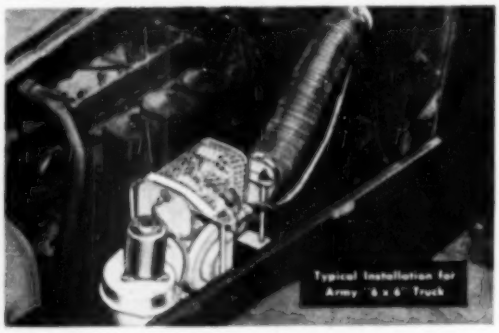
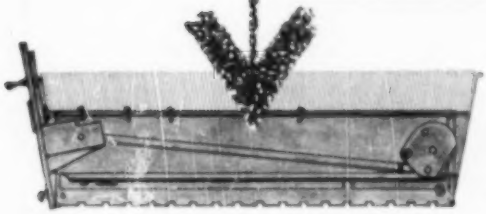




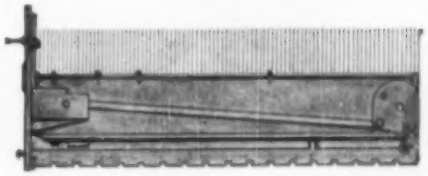
Specialized installation kits with simple instructions are now in depot storage under proper military nomenclatures. Technical service manuals and test equipment are also available to organizations in the field.

ASK NOW *about this reliable new South Wind 978 heater, available and authorized for easy installation on your military vehicles.*

Robot-Filer's *NEW SLANT* means low-cost filing



OPEN: Robot-Filer drawer slants open *front and back*, creates a full 7-inch filing "V", even when crammed with papers. Papers can be found with ease, quickly returned.



CLOSED: Back and front of drawer return to vertical *automatically*, with contents compressed. Tilting is mechanically controlled, automatic.

Your largest single cost in filing is *labor to operate your files*. When you make filing easier, you make it less costly.

Robot-Filer's dual tilt control *automatically* forms a generous seven-inch filing "V" as the drawer is opened. Folders are removed or inserted without tugging or straining. Folder tabs slant toward the eye, can be read easily, even those in bottom drawers. As you roll the drawer closed, Robot-Filer's tilting mechanism *automatically* pulls in drawer ends. The front cannot remain slanted when the drawer is closed.

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Atomic ENERGY

SYNCHROTRON SUCCESSFUL

A new type of atom smasher, ultimately expected to produce X-rays of 300,000,000 volts, has been successfully operated in its first phase. The new machine is known as a "nonferromagnetic synchrotron" and is being built under the joint sponsorship of the Office of Naval Research and the General Electric Research Laboratory. It has been operated thus far up to about 70 million volts and probably it will be in operation at much higher energies before the end of the year. It will be used to study the effects of high-energy radiation, particularly in nuclear research.

The new particle accelerator is of a design that eliminates the huge iron-core electromagnet commonly used in such devices. The requisite powerful magnetic fields are produced solely by specially designed coils of wire. These carry heavy currents and are contained in a steel tank from which air has been exhausted.

NEW RESEARCH CONTRACTS

The U. S. Atomic Energy Commission has approved forty-one research proposals in the field of biology and medicine, it was announced recently. Thirty-four of the proposals are for new research projects at universities, hospitals, and private research laboratories, six are for renewals of existing projects, and one covers a working agreement with the Fish and Wildlife Service of the Department of the Interior.

The proposals were submitted by investigators at thirty-five different institutions located in twenty States and the District of Columbia.

Award of the 34 new contracts will bring to 194 the number of A.E.C.-supported research projects now being carried on in biology and medicine at 87 universities, hospitals, and private research centers. Approximately $5,000,000 has been set aside for support of such research in non-A.E.C. agencies.

The scope of the program under which A.E.C. research support is extended in biology and medicine comprises the biological effects of radiations, including medical and cancer research, and, to a limited extent, the use of radioisotopes as tracers.

The Atomic Energy Commission also awarded twelve new contracts in physical research totaling $1,345,660 during the first three months of 1950.

The new contracts were awarded to: California Institute of Technology, Pasadena, Calif.; George Washington University, Washington, D.C.; New York University, New York, N.Y.; Pennsylvania State College, State College, Pa.; University of Florida, Gainesville, Fla.; University of Illinois, Urbana, Ill.; University of Louisville, Louisville, Ky.; University of New Hampshire, Durham, N.H.; University of North Carolina, Chapel Hill, N.C.; University of Puerto Rico, Rio Piedras, P.R.; Western Reserve University, Cleveland, Ohio; and Yale University, New Haven, Conn.

RADIOISOTOPE PRICES

The Atomic Energy Commission recently announced the availability of fission-product radioisotopes in greater quantities and at reduced prices. The A.E.C. said it would be able to step up production and reduce the price of these materials because of a new radioisotopes processing area placed in operation at Oak Ridge National Laboratory. The new buildings are equipped with special remote-control devices for carrying out difficult chemical processing manipulations behind thick concrete walls. Laboratory personnel are now able to handle much larger quantities of highly radioactive materials. (Continued on p. 14)

THE CONTINENTAL TRADEMARK STANDS FOR DEPENDABLE POWER

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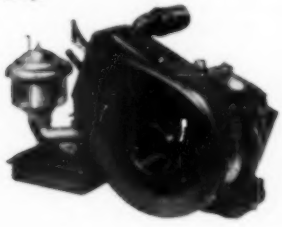
Four-cycle, single-cylinder, air-cooled industrial engine for lawn mowers, pumps, scooters, garden tractors, and similar applications. Develops ¾ to 1 h.p. AC6, identical in design, delivers 2 h.p.



Continental Motors' broad line of engines and power units includes at least one model for virtually every job in transportation, in industry and construction, and on the farm . . . a model not only designed with the specific application in mind, but proved in actual on-the-job performance over the years. The Red Seal line, ranging from ¾ to 270 h.p., includes models adaptable to use with various standard fuels.

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Atomic Energy

Fission products are different from most radioisotopes coming from the nuclear reactor since they are produced by the nuclear splitting of uranium rather than by the bombarding of ordinary stable elements. Many different fission products are produced simultaneously and hence the material is extremely radioactive.

Prices of all the fission products, some sixteen items, have been reduced considerably. For example, radioactive iodine has been reduced from $1.00 per millicurie (radioactivity unit) to 75 cents per millicurie, and radiostrontium and radiobarium from $1.35 to $1.00. In the case of the latter two isotopes the price is further reduced to 50 cents per millicurie for quantities of 100 millicuries and more.

Even the more expensive items, such as radioactive promethium and neodymium, formerly priced at $100 and $75 per millicurie, have been reduced to $75 and $50 respectively.

A fission product now in routine use is radiostrontium. This isotope is now being used in a number of industrial plants for measuring the thickness of sheet materials such as paper, rubber, plastic, and rolled steel. Rays of radiostrontium have also been used for postoperative lesions of the eye.

NEW AIR FILTER

A new inexpensive paperlike filter material designed for filtering fine radioactive particles from contaminated gaseous wastes has been developed for the Atomic Energy Commission by Arthur D. Little, Inc., research and engineering organization of Cambridge, Mass. The development may have general commercial or industrial use, for instance in filtering the smokestack gases which now cause fumes or smog.

The new material contains treated paper-making fibers in combination with very finely divided mineral asbestos fibers. The material is made in soft flexible sheets which can be pleated and formed into shapes to fit filtering units of large capacity.

A.E.C. facilities using cooling or ventilating air which might become contaminated with radioactive particles take extreme care to eliminate such particles before the air is discharged into the atmosphere. Air filters developed and used by the Chemical Warfare Service for protection against gas warfare have proved satisfactory, and for some years the Army has been supplying A.E.C. with filter units. With the expansion of the atomic energy program, however, the demand for filters has grown rapidly. In order to develop alternate sources of supply and possibly to reduce filter costs, the A.E.C. initiated a program for filter research and development.

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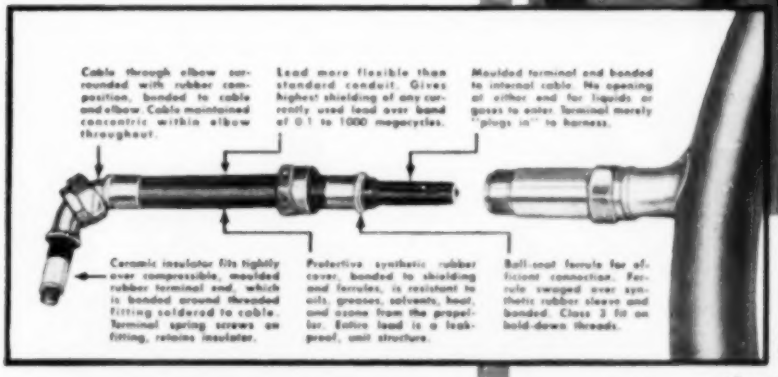
Cable through elbow surrounded with rubber composition, bonded to cable and elbow. Cable maintained concentric within elbow throughout.
Lead more flexible than standard conduit. Gives highest shielding of any currently used lead over band of 0.1 to 1000 megacycles.
Moulded terminal and bonded to internal cable. No opening at either end for liquids or gases to enter. Terminal merely "plugs in" to harness.
Ceramic insulator fits tightly over compressible, moulded rubber terminal end, which is bonded around threaded fitting soldered to cable. Terminal spring screws on fitting, retains insulator.
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Service to Country

The Dominant Characteristic of the Ordnance Fraternity

Edward T. Gushée, chief of the Detroit Ordnance District and vice-president of the Detroit Edison Company, whose picture graces the front cover of this issue, continues to render yeoman patriotic service to the Ordnance cause. Born in Los Angeles, Calif., he was graduated from Kent School, Conn., and is now president of its board of trustees. He attended Pomona College, Calif. In the First World War Mr. Gushée was a captain in the 64th Infantry, A.E.F. During the Second World War he served with the Ordnance Department of the Army in Washington and since the war has been a civilian chief, directing the vast peacetime operations of the Detroit Ordnance District. He is a charter member of the Michigan Post, American Ordnance Association, and was recently reëlected Post president.

A LITTLE while back a great American newspaper, referring in complimentary terms to the loyalty of the members of the American Ordnance Association, described them as being "practical, realistic, hard boiled." While accurate, the characterization missed the dominant note of A.O.A. philosophy which is: Peace through Strength—to keep our country spiritually and materially strong, politically free, and mentally alert. The A.O.A. philosophy of our national defense is daily more essential when so much fuzzy thinking in so many fields is weakening our posture of readiness.

"Peace through Strength"

It is refreshing to recall that the Ordnance fraternity can boast as members so many fine, loyal Americans throughout the land whose allegiance to "Peace through Strength" is a real bulwark in maintaining our system of free competitive enterprise. Their loyalty to our national defense is likewise a consoling evidence of sound patriotism at a time when that virtue is too frequently conspicuous by its absence.

The civilian chiefs of the Army Ordnance districts are excellent examples of the kind of patriotic service to which we refer. As typical, we cite the life and work of Edward T. Gushée, civilian chief of the Detroit Ordnance District and president of the Michigan Post of the American Ordnance Association. His company, the Detroit Edison Company, is sponsoring the television program "Crusade in Europe." In an introductory address on the program Mr. Gushée recently described his philosophy of patriotic service to God and country. It is a philosophy to which all the members of the Ordnance fraternity pledge wholehearted support. Mr. Gushée's address follows:

"War Is Abhorrent"

"War is abhorrent to us all. As a nation, in the past we have been like an ostrich and stuck our collective head in the sand, for we have refused to believe there could be a war and have neglected to prepare. Yet since our birth as a nation we have engaged in seven major wars. And we have never been ready. We have been saved great trials and tribulations by our allies or by fortuitous circumstances. Next time—if there be a next time, which God forbid—we shall be the first to be attacked. We must be ready! Lack of preparedness in all our history has not kept us out of war. Preparedness may well this time forestall a war, and if it does not it can pave the way to quicker victory.

"This subject of preparedness as a means of forestalling war is of particular interest to Detroit and to Michigan—the Arsenal of Democracy.

"I am proud that I succeeded, as civilian chief of the Detroit Ordnance District, my old chief and well-loved friend, Alex Dow, for a great many years president of the Detroit Edison Company. . . He did much after the First World War to help in preparedness, despite the lethargy of the country as a whole. . . He put his time and substance at the service of his country.

At present, the Detroit Ordnance District is an important cog in the overall plans of the Department of Defense. Reporting to Maj. Gen. E. L. Ford, Chief of Ordnance of the Army, under the able administration of my deputy, Lieut. Col. John M. Cone, it is charged with the responsibility of procuring all automotive equipment for the Army, Air Force, Navy, and Marine Corps. Automotive equipment includes trucks, jeeps, cars, tanks, and matériel of every sort—the backbone of defense.

"We here, as citizens of our great country, can each assume our own individual responsibility—that duty which is a part of our beloved freedoms. Preparedness is terrifically expensive, and yet it is so worth while to sacrifice a little in the present rather than to suffer greatly, even to the loss of our lives and our freedoms, in the future.

Pray for Guidance

"We can use our influence, each one of us, to the end that we keep prepared and thereby do our bit to stay out of war. And, too, we can present our prayers, each one of us—Jew or Gentile, Christian or Mohammedan—to that God who guides our destinies, that in the critical state of the world He may so guide us as to save us from the calamity of another war."

SPECIAL DELIVERY—AIR. *Everything came by air at Exercise Swarmer—men, weapons, ammunition—even the jeep in the foreground which is being divested of its parachute harness and made ready for action (Armed Forces photo).*

Army-Navy

Can We Depend on It for Victory in a Future War?

Lowell M. Limpus

THE well-known author and publisher, Bill Ziff, who used to insist (before World War II) that the big bomber would be the decisive weapon in the coming conflict, frankly confessed recently that he had been wrong. He did so in the course of a television debate in which he and I happened to be allies against a pair of speakers who were advocating an immediate international ban on the atomic bomb. And he made it clear that he had learned something from that previous mistake.

He warned his hearers against expecting too much of the seemingly all-decisive bomb, as well as against discarding that exceedingly useful weapon until we are quite certain that the rest of the world has disarmed simultaneously. He had something on both counts, and I enthusiastically shared his position.

But it might be well to amplify the argument a bit and see where it leads us in terms of preserving and developing our potential strength for the industrial production of the ground arms. The discussion is apt to precipitate a whole series of questions, among them the following:

1. Is it probable that either the atomic weapon (or its even more deadly sister, the hydrogen bomb) will be used in the next war?

2. If it is used, will it prove to be the decisive weapon that its supporters claim?

3. If it isn't used, or if it doesn't prove decisive, what kind of odds will the United States be up against in terms of the weapons that will be used and may be decisive?

4. What can we do about altering those odds if they turn out to be unfavorable?

Atomic Conflict Probable

Taking up the questions in order, there seems to be considerable evidence that atomic weapons will be used in any future conflict between (we might as well be realistic) the United States and Russia. This seems reasonably certain, regardless of any international agreements or systems of atomic control that may be engineered by the United Nations.

"I have but one lamp by which my feet are guided," said Patrick Henry, "and that is the lamp of experience." Well, experience appears to indicate that any effective new weapon is bound to come into general use, despite any and all well-meant efforts to ban it. Military history is full of examples, and it should be necessary to cite only a few typical ones.

International covenants, as well as all chivalric traditions, were violated right and left in World War II when it came to the bombing of formally proclaimed open cities and the slaughter of harmless civilians; the Japanese ignored the civilized ban on toxic gas in their Chinese war, just as the Germans had done in World War I.

Skipping a few centuries, we find that all the power of the Church, as expressed through the Lateran Councils, couldn't maintain the ban it placed on the death-dealing crossbow, while Chevalier Bayard was equally unable to rule out the use of cannon, even though a hanging penalty was imposed on the artillerymen. (The gallant knight "without fear and without reproach"

Lowell Limpus is a captain in the Inactive Reserve and writer of a nationally syndicated column on military affairs. A former managing editor of the *Army-Navy Journal*, he is now military analyst of the New York *News* and the author of a number of books, among which are "Twentieth Century Warfare" and "How the Arms Fights." Mr. Limpus is also a radio and television commentator and is a member of the American Military Institute.

seems to have regarded the new explosive projectile of his day with the same fear and horror which most of us feel today for its atomic successor—and the chances are that it appeared just as revolutionary and horrible to the armored knights who were accustomed to facing foemen under the limitations of a formalized code of warfare at close range.)

It seems highly probable, therefore, that the new bombs will be put to use, no matter what kinds of bans may be imposed—and it would be suicidal for us to rely upon any variety of international agreement signed by a potential foe who has been notorious in recent years for violating other treaties signed with friendly nations (who didn't survive long after putting their trust in his pledged word).

The extent to which the new weapon will be used—whether banned or not—probably will depend upon circumstances, however. It may be held in reserve while the opponents feel out each other's strength, as was the case with the big bombers during the "phoney war" period of the recent conflict. It might never even be used at all, for fear of retaliation, as happened with gas during World War II. (Both sides knew that each had a stock pile of the noxious stuff ready to deliver if the other started using it, just as they are pretty sure today that each is ready to retaliate in kind as soon as the first atomic bomb is delivered.)

Will It Be Decisive?

But whether atomic bombs are hurled across continents in quantity lots or merely used sparingly, if at all, the next question must be faced, and it is the $64 one! Will the new weapon prove to be as decisive as its supporters claim?

Experience and analysis both seem to lead us to the same conclusion.

We've heard all the claims made for weapons such as the atomic bomb before—or at least our predecessors have—and they were just as sweeping and just as positive. In every case, military men who accepted them, and then acted on the acceptance, either lived to regret their gullibility or else they didn't live long enough to regret anything. Again history is replete with examples.

My friend Zitl and the eminent company in which he found himself were just as certain before World War II that the giant bomber was bound to revolutionize warfare, and a number of earnest apostles of that school strongly urged Uncle Sam to put all his eggs in one big airborne basket. Circumstances later proved that it was exceedingly fortunate that he had not done so but stubbornly stuck to the training of the foot-slogging doughboy who finally had to go in with the usual artillery support and carve out victory in the old-fashioned way.

The same kind of claims were made

for the tank just after World War I, for gas during that war, and for heavy howitzers in the years that preceded it. Back at the beginning of the century it was the machine gun that was going to force everybody to discard all other weapons, and thirty years before that it was the French needle gun, on which Napoleon III panned too much confidence.

We can go right on back through the ages and hear the same identical claims made for the British longbow, the crossbow, Greek fire, the cannon, the Roman legion, the Macedonian phalanx, and that nerve-shattering apparition of the battlefield, the war elephant (which probably looked like an atom bomb to the astonished Alexander).

But down through the years experience proved the claims groundless, and in every case it proved exceedingly dangerous to rely too much on the new weapon.

Of course, in almost every case the new weapon brought about a radical change in tactics. It is a military axiom that, although strategy never changes, tactics are revolutionized by the appearance of any effective new weapon on the battlefield. But in no instance has the revolution in tactics involved the immediate superseding of all the old weapons by the new one. And that may be one reason that conscientious students of their profession, like Gen. Omar N. Bradley and Gen. J. Lawton Collins, are still diligently trying to improve and increase the efficient use of the present ground arms.

Question Three

But the fact remains that if the bomb isn't used or if it doesn't prove to be immediately decisive when it is used, we'll be squarely up against Question Three—and the answer today is apt to be disturbing.

The odds are definitely against us on the ground, and they may not be too comforting in the air. As regards the sea, they appear to be imponderable at the moment.

When it comes to man power, however, the odds don't seem to be as one-sided. Capable analysts have already pointed out that we and our Western allies can muster 2,000,000 men in our land forces, as compared with 2,500,000 for the Soviet Union. That appears to be fairly comforting when we consider our superiority in equipment and industrial potential and the fact that we control the seas and that our air power is supposed to be more effective.

The trouble is that they don't pay off on man power—they pay off on firepower.

The fact is that man power is almost useless for large-scale ground fighting until and unless it is molded into and measured in terms of firepower. The reason should be self-evident. Ten men with machine guns are more than the equivalent of a hundred with rifles under certain circumstances—and if they are in tanks with proper equipment they may be superior to a couple of thousand.

Therefore the only sensible method of comparing man power is to compare it after it is organized into units of ap-

History has shown that there has never been a single decisive weapon. We should place our hope for peace and security in a well-balanced land-sea-air force.

proximately the same firepower—and that means divisions. When it comes to that kind of comparison, our land forces don't shape up so well. Instead of odds of 2½ to 1, we find we are facing a ratio of almost 4½ to 1—and if we don't count in our Atlantic Power allies, but simply rely on our own forces, it's 17½ to 1!

The trouble is, of course, that we don't have anything comparable to the number of divisions that Russia has ready for combat, and ours are scattered all over the globe while her's are concentrated where they will do the most good.

Last October General Bradley was quoted by several Senators as having told the Senate Appropriations Committee that Russia has 175 combat divisions ready for action and is in a position to increase that total to 502 divisions "within a matter of months."

Recently General Collins, writing in the May issue of ORDNANCE, told its readers that we have a total of ten divisions, plus three excellent constabulary regiments, and he didn't indicate that he was satisfied they were ready for immediate action. Furthermore, he explained that four of them were in Japan and one in Europe, with the remaining five in training over here.

Research indicates that these ten American divisions could be backed up by thirty more, contributed by our allies—but only something like twenty-three of them are in Europe, and they are scattered about and of uncertain quality. Eight of them are Italian, five French, two British, two Belgian, two Dutch, one Norwegian, one Danish, and one Portuguese. Russia has thirty divisions in Occupied Europe, with seventy-five more right behind them in Western Russia. She has thirty in the Far East to face our four—and she also has a lot of satellite divisions that don't enter into the formal count.

They are backed up by what Hanson Baldwin, the well-known military writer, calls "a cushion of space—the vast geography of Russia," plus "the world's finest tanks." He thinks it "would be a great mistake to underestimate the Soviet armed forces."

They also have the advantage of concentration on interior lines, something which we emphatically lack, and the lack of which accounts for what at first glance appears to be a sinful waste of what man power we do have. Our armed forces number something like 1,600,000 men, but that total includes the Air Force, the Navy, and the scores of thousands of soldiers that must man the supply lines to all parts of the earth.

Advantage at Sea

While we are thus heavily outmanned on the ground, we retain an advantage on the sea—always providing that we don't encounter something fancy and novel in the way of submarines and that our Air Force hopes to achieve better than a standoff by matching quality in aviation against quantity. This hope could be deceptive, but it seems to be offset by the apparent fact that we, at least for the time being, possess more and better atom bombs.

The disturbing fact remains, however, that a mistake in any of these conclusions—and we have been known to make mistakes—would leave us in a very precarious position on the land.

The chances are that the outbreak of war in Europe would find us rocked right back on our heels from the very beginning, unless the Air Force could produce a whole series of miracles. There is no doubt that American soldiers would die very gallantly, as they died on Bataan or in the Alamo, and we would react as we have always reacted—going to war with a whoop and loud vows of revenge and tossing billions about with prodigal abandon in place of the millions we might have spent while we had time.

And that brings us to the answer to the fourth question, because it involves the use of whatever time we have left to us. How much time that is, nobody knows—except possibly a gentleman sleeping in the Kremlin as you read these lines. But whatever it is, it probably won't be sufficient to make up for that which we have so cheerfully wasted as we dismantled the greatest war machine the world ever saw. Whatever time remains should undoubtedly be devoted to rebuilding as much of that machine as possible—and the job of doing this is up to American industry as well as the military.

General Collins gave you an outline in these pages of the progress and improvements that we are making in the development of ground weapons. Some of you readers already are familiar with details which can't be made public at this time, because you have been working with blueprints marked "Secret."

And the answer to Question Four: The only thing any one can do about readjusting those odds is to transform those blueprints into new and improved weapons as fast as the Good Lord and the Congress of the United States will permit.

After that it will be up to the generals to see that the men are molded into divisions and equipped with the weapons so that their firepower may be utilized to even the odds.

But until they are evened, better not rely on that bomb too much. And keep your fingers crossed!

"The casualties produced by the blast from the detonation of an atomic bomb can be divided into those resulting from both direct and indirect blast. By direct blast is meant the force resulting from release of energy at time of detonation. Very little evidence of any direct-blast effect on humans was found at Hiroshima or Nagasaki. Indirect blast effect results from flying debris, falling buildings, flying glass, etc. This was extremely important in Japan and produced a tremendous number of casualties. . . Windows were broken as far away as fifteen miles.

"The heat liberated by the detonation of the atomic bombs was most significant in producing casualties. Human skin which was exposed was charred up to a distance of 1,200 yards. Human skin exposed up to a distance of three miles sustained second-degree burns. . . Many persons were burned or perished in the fires which swept both Hiroshima and Nagasaki within one hour after the detonation."—MAJ. G. M. MCDONNELL, *Army radiation biology expert, in the March-April 1950 issue of* ORDNANCE.

by

Col. Robert H. Williams

Colonel Williams, of the United States Marine Corps, recently completed a tour of duty on the staff of Britain's School of Combined Operations

Strongly fortified enemy positions can be defeated by teams of tanks specially equipped to detonate mines, lay mats, fill ditches, and bridge walls

U.S. Army

Armored Breaching Vehicles

WORLD WAR II, in so far as the operations of ground forces were concerned, was characterized by three things: an increased use of tactical air support, increased mechanization, and the amphibious attack. This article deals with a special problem which bears on the latter two—the problem of how to project armor ashore quickly in the landing assault.

The most difficult task which confronts armor in a land battle is an attack against well-prepared enemy defenses—a fortified position which the enemy has had ample time to construct. In an amphibious attack it may be confronted with similarly strong defenses in the area chosen for the assault, but it must then also overcome the additional handicap and initial disadvantages inherent in making its final approach to the enemy position via an unfamiliar and inconvenient medium—the sea.

The purely logistical aspect is not difficult. It was quickly solved during the war. When Dunkerque and the fall of France in 1940 made it obvious that victory in Europe could only be achieved by an amphibious return to the Continent, the Landing Craft, Tank (LCT), and the larger Landing Ship, Tank (LST), were quickly produced. But let us consider the tactical aspect of the H-hour assault.

It is not practicable to risk such a large vessel as an LST by beaching it at H-hour. Although LCT's carrying tanks were beached at H-hour or very close to that time in the Normandy landings, this is not considered desirable from the naval point of view, both because of the risk to these craft and the amount of beach room they occupy at the peak traffic period of the incoming assault.

Armor and Firepower

Armor is wanted on the beach from the outset. In addition, it is highly desirable for the tanks to be able to fire during the last few hundred yards of the run-in while still water-borne.

During World War II the British solved the problem of getting tanks ashore at H-hour with the DD (duplex-drive) tank (Fig. 5). The DD was a standard tank equipped with a canvas screen high enough to make it float and with propellers to drive it through the water under its own power. It was launched at about 6,000 yards from the beach from an LCT and swam in. It is not very handy navigationally, only makes between four and five knots, and cannot fire while the screen is up.

In the Pacific it was not the practice to land tanks in the leading wave. The emphasis was more on the problem of how to get some firepower which could shoot during the last few hundred yards of the run-in when naval gunfire had to lift in order to insure the safety of the troops in the first wave of landing craft.

To this end the Landing Vehicle, Tracked (Armored) was developed. The LVT(A) is really an improvisation. It evolved from the LVT and was in fact nothing more than a tracked

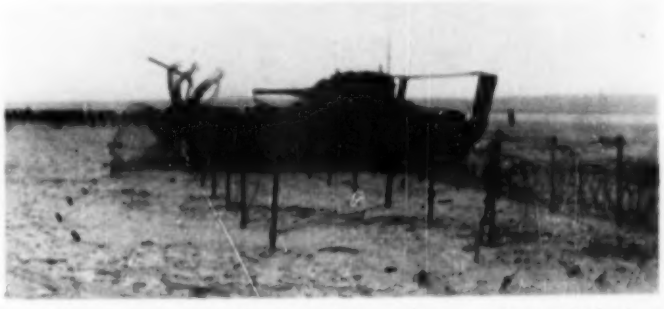

Fig. 1. The flail tank beats through a wire entanglement to detonate land mines.

amphibian with a built in turret mounting a 75-mm. howitzer which could fire on the run-on. The LVT(A) is not a heavily armored fighting vehicle, and if it is used as such it will not last very long.

The U.S. Army used the British DD device at Normandy with very unhappy results—a very high percentage of tanks were drowned in the heavy seas off Omaha Beach. The British had much better luck with theirs, and their postwar amphibious doctrine definitely calls for the landing of DD tanks in the leading wave.

Fig. 3. The ramp-equipped Ark enables tanks to cross walls and ditches.

Armor vs. Obstacles

Having considered the difficulties of getting armor on the beach at H-hour, let us now visualize heavily fortified beach defenses confronting the tanks as well as some bad terrain which they must cross. Let us say that they must cross soft mud patches, get over a formidable sea wall, negotiate a wide and deep antitank ditch, cross a mine field, and, finally, pass over a 25-foot stream before they can deploy. Enemy antitank weapons, many of which may not yet have been put out of action, will have been sited to engage targets at these obstacles. The tanks appear to be in for a tough time.

What is the answer? The British answer is the Breaching Team, equipped with specialized armor, sometimes referred to as the "funnies."

These specialized armored vehicles are simply modified tanks of several types, each equipped with devices to deal with one of the obstacles mentioned above.

Breaching teams are composed of such types and numbers of these specialized tanks as are needed to do the job in hand as disclosed by reconnaissance and aerial photographs.

Breaching Vehicles

In the British Army they are called AVRE (Armored Vehicle Royal Engineer) and are manned by that corps. Useful types include the Bobbin (Fig. 2), which unrolls and lays coir matting in front of itself to enable following tanks to cross soft ground or mud; the Ark (Fig. 3) which has ramps fore and aft to enable vehicles to get over a sea wall which cannot readily be demolished; the Fascine (Fig. 4) which, in conjunction with the armored 'dozer, can cope with antitank ditches; and the Bridge (top of p. 21) which can span a small stream. Flail tanks (Fig. 1) for exploding mines, and flame and petard tanks for dealing with pillboxes may also be included in the breaching team.

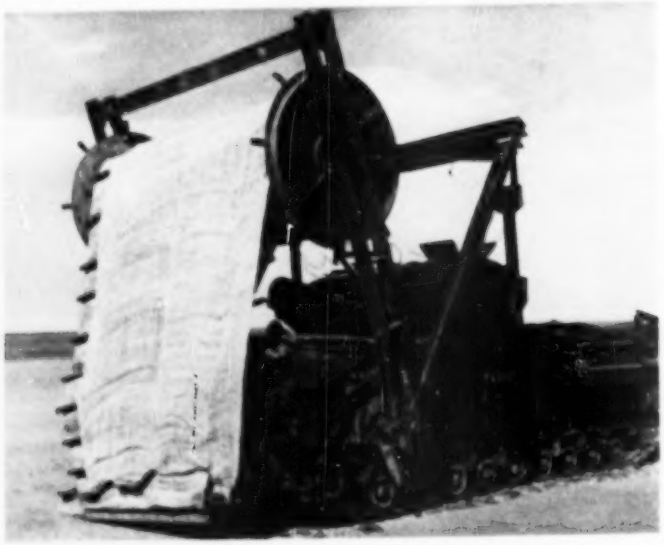

Fig. 2. The bobbin tank lays reinforced coir matting over soft terrain.

Each team has the task of preparing one path for armor across the obstacles and mine fields. Three teams are allotted each infantry battalion landing beach in the hope that at least two will be successful. The three teams on each battalion beach are under command of a tank officer for general coördination.

In the British system the breaching teams do not come under command of the infantry battalion commander on whose beach they operate. They are not even considered to be in support of the infantry. The breaching operation and the infantry assault, although they take place simultaneously on the same area, are, in reality, almost entirely unrelated. The DD tanks wait on the beach, affording fire support to both breaching teams and assaulting infantry until the paths have been completed. When this has been accomplished the armor can proceed through the hard crust of the enemy's fortified defenses to the ground beyond where the going is good.

Under this plan the breaching vehicles arrive at the beach in LCT's. It

may well be asked why the British do not "DD" them and swim them in. The fact is that the "funnies," or at least most of them, cannot be successfully floated because their added equipment is so bulky and heavy.

However, to make a virtue of necessity, it is generally felt that it would not be desirable to DD them anyway. The reason for this attitude is that it is essential for all the AVRE of a breaching team to arrive at the beach as a unit. Swimming them in would be uncertain. They might become scattered, reach the beach in the wrong order, or become swamped in heavy surf. The success of the breaching operation is so vitally important that it is felt that they should be ferried in in landing craft even if they could be DD'd.

The question may also be raised as to why the breaching teams are necessary in amphibious operations. The Pacific veteran may observe that we didn't use them in our landings against the Japs. I can only suggest that perhaps the nature of the terrain in many Pacific island targets did not lend itself to exploiting armor in the mass; and that perhaps in some cases we used men instead of metal.

Obstacles in some cases were overcome by engineers who did not have the benefit of doing this work behind metal. This had one of two results: If done quickly and promptly it caused excessive casualties among the engineers; if engineer casualties were avoided in this hazardous task it was because the obstacle clearance was left until the infantry, fighting unsupported, had first neutralized the area. This meant more infantry casualties.

Fig. 5. The amphibious DD tank exploits the breaching team's breakthrough.

Not Always Amphibious

It must not be thought that the breaching team is primarily amphibious. It is only incidentally amphibious through occasional necessity. The breaching team and its AVRE are a device for punching through the hard crust of a fortified position complete with obstacles and mine fields. It is only when a landing assault must be made against a beach area thus fortified, and where armor can be committed, that the breaching team must be amphibious.

The AVRE is really an improvisation. It is a tank on which is hung special equipment to deal with special obstacles or defenses. Possibly the large-scale landing assault against a strongly defended enemy coast will never again be necessary. It is certainly difficult to relate logically the large-scale landing to the phase of active warfare between two belligerents who are both still able to use weapons of mass destruction against each other. Such a landing would be more apt to come after the atomic phase has been won. It might then resemble the occupation of Japan in 1945 rather than the Normandy operation.

But it must be remembered that breaching operations are apt to be necessary whenever armor attacks ground defenses. The AVRE, taken individually, is not startling or unusual. Each type was probably used by U.S. forces many times in many actions. Some of them, such as the armored 'dozer and the flail, are very familiar. It is the concept of these armored vehicles and their trained operators organized as a team which is important.

We Must Be Ready

If the past pattern of mechanized warfare should repeat itself in the future we must be ready to design and produce better and more efficient types of armored breaching vehicles to deal with the more formidable defensive obstacles and antitank mines which will undoubtedly be encountered. (Illustrations in Figs. 1, 2, 3, 4 are by courtesy of *The Marine Corps Gazette* and the British Imperial War Museum.)

Fig. 4. Fascine-carrying tanks fill up antitank ditches.

Boeing Wichita

Ordnance in Army Aviation

The Department Is Now Responsible For the Soldier's "Flying Jeep"

by

Capt. Michael J. Strok

Ordnance has been assigned the procurement, inspection, modification, supply, and maintenance of the light liaison aircraft used by the Army

SHOOTING, rolling, tracklaying, amphibious—the traditional 2-dimensional concept of ordnance has now been extended into the third dimension to include flying ordnance!

An unheralded but significant milestone was reached on June 6, 1960, when the Ordnance Department of the Army noted the first anniversary of the adoption of the youngest member of the 148-year old Ordnance family—Army aircraft. With this adoption, Ordnance took over from the Department of the Air Force most of the logistics responsibility for some ten different types of liaison fixed-wing and helicopter aircraft, supplies, and associated equipment.

Army Aviation

In June 1942 Army Aviation, then known as organic air observation, was born. At the recommendation of Lieut. Gen. Leslie J. McNair, Commanding General, Army Ground Forces, the War Department authorized on June 6, 1942, organic air observation for field artillery. The use of light, unarmored and unarmed liaison-type aircraft for the accomplishment of this purpose was specified. This decision was based largely on the successful service testing in the then largest prewar peacetime Army maneuvers held in Louisiana and the Carolinas during the summer and fall of 1941.

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Air Observation Posts

From this beginning the artillery air OP's (air observation posts) grew to a peak World War II operational strength in excess of 3,500 liaison aircraft of the L-4 and L-5 type. The maintenance and supply support was primarily a responsibility of the Army Air Forces while the operational control was centered at division, corps, and army level.

Organizational (user) maintenance was accomplished by trained artillery soldier-mechanics, one to each two aircraft. Each artillery battalion was assigned two aircraft, two officer pilots, and the mechanic and ground crew assistants, who were under the direct control of the battalion commander. Usually each battalion air section had its own little unprepared airstrip located in the vicinity of the command post.

In a combat rôle these artillery aircraft, flown by specially trained artillery officers, were utilized primarily to expedite forward movement of the ground combat arms by the performance of aerial reconnaissance and observation missions. These included locating appropriate targets, adjusting artillery and mortar fire, obtaining information on enemy defense forces, limited front line aerial photography, emergency aerial wire laying, aerial resupply, and aerial evacuation of wounded. Because of their versatility and high degree of utility these ubiquitous "flying jeeps" also assumed an important secondary administrative rôle as staff transportation and courier vehicles.

After the cessation of hostilities, the combat success and potentialities of organic Army aircraft were recognized by the War Department Equipment Board to the extent that equipment authorizations were increased to provide Army aircraft as part of the normal combat equipment for infantry regiments, combat engineer and armored cavalry regi-

ments, and certain Signal Corps units. In recognition of their useful administrative rôle, organic Army aircraft were also authorized to Army headquarters and to the several training schools and centers.

With the establishment of the authority contained in the National Security Act of 1947, three coequal Departments of Army, Navy, and Air were formed. The resultant shifts in organization and responsibilities brought about certain administrative adjustments and delineated, by virtue of various joint Army and Air Force regulations, the functions and responsibilities of the two Departments.

From these, Army Aviation was created—its missions, responsibilities, types and kinds of equipment. In addition, the over-all departmental responsibilities with respect to training of flight and maintenance personnel; the determination of quantitative requirements and budgeting for Army aircraft, parts, and accessories; the responsibility for research, development, procurement, supply, and maintenance; and technical publications were fixed by mutual agreement between the Departments of the Army and Air Force.

The accomplishment of such agreements resulted in the publication of Army Regulations and other documents assigning to each of the technical services within the Army certain detailed responsibilities for Army aircraft, spares, and allied equipment as well as the many other Air Force procured items used by the Army. Thus, in June 1949 the Chief of Ordnance was assigned, with respect to Army aircraft, responsibility for these functions:

1. The computation of quantitative requirements and the providing of necessary funds within the Ordnance budget; and

2. The technical staff coordination with the Department of Air Force on matters pertaining to:

Procurement.—The transfer of required funds; the providing of qualitative and quantitative information on matters such as Army operational, maintenance and supply requirements, delivery rates and shipment.

Inspection and acceptance.—Representation on mock-up and engineering or

Fig. 1. The Bell H-13B is used in observation and liaison (Army photo).

Fig. 2. The Ryan L-17B is primarily for utility and administrative missions.

Fig. 3. The Aeronca L-16A is employed principally as a training airplane.

Fig. 4. The Consolidated-Vultee L-13 is used for resupply and evacuation.

production acceptance inspection boards (Ordnance is the technical adviser to the using service—Army Field Forces).

Modification.—The promotion of effective coordination with the technical agencies of the Air Force for the review and approval of proposed modification or modernization projects; the final approval of expenditures of Ordnance funds for such projects; the continuous study of unsatisfactory or malfunction reports, and the initiation of corrective action.

Supply.—The providing of quantitative data and funds for the purchase of required replenishment spares and supplies.

Depot maintenance.—Since major rebuild is a continued responsibility of the U.S. Air Force, Ordnance overall rebuild requirements are scheduled with Air Force depots.

Preparation and publication of technical publications.—The coordination and review prior to publication of those U.S. Air Force technical publications applicable to Army aircraft and allied equipment.

3. The Chief of Ordnance has Army-wide staff supervision over: (*a*) The allocation and distribution of Army aircraft to the users in the same manner as other major items of equipment; (*b*) The technical inspection of the maintenance in using organizations and in Ordnance maintenance units; (*c*) The administrative supervision of supply procedures at the various posts, camps, and stations; (*d*) The performance of organizational (user) and field maintenance.

As may be evident, there exists divided responsibility between the two Departments with respect to certain functions as were outlined briefly in the preceding paragraph. This is in consonance with the current Department of Defense unification policy which provides that the Department having procurement responsibility for a given major item is charged with responsibility for research and development, depot maintenance, bulk (depot) storage and issue, and technical publications.

Field Maintenance

With the assignment of these responsibilities, perhaps the most pressing problem demanding immediate solution was the method for the accomplishment of the necessary field maintenance of the more than 700 Department of Army aircraft located in the United States and the overseas theaters. The answer was the activation and organization of Ordnance Light Aircraft Maintenance Companies and Detachments.

These are semimobile organizations composed of Ordnance aircraft maintenance specialists—aircraft and engine mechanics, welders, sheet-metal mechanics, and the even more specialized helicopter mechanics. The Ordnance officers of the units are aircraft engineering and test flight personnel qualified as fixed-wing aircraft and helicopter pilots and maintenance supervisors.

> **"Initiation of this latest Ordnance service has opened a new career field of opportunity, particularly for the Ordnance soldier-mechanic."**

The technical training of the maintenance and flight specialists is, by joint agreement, carried on by existing training facilities of the Department of the Air Force. Selected Ordnance officers under the age of 35 who volunteer for this new phase of Ordnance activity receive approximately eight months' flight and aircraft-maintenance training in both the technical aspects at Air Force schools and the tactical or operational phase at the Air Training Department of the Artillery School, Fort Sill, Okla.

Since rotary-wing aircraft (helicopters) comprise a substantial portion of Army aviation equipment, trainees also undergo an additional 6-week instruction in the specialized helicopter flight and maintenance techniques. Upon successful completion of instruction these officers are rated by the Department of the Army as Army aviators.

Initiation of this latest Ordnance service has opened a new career field of opportunity, particularly for the Ordnance soldier-mechanic. Recognition of this specialty has been made by the provision of an Army aircraft maintenance career field which allows the interested, qualified soldier to progress to the several grades of warrant officer as a maintenance specialist.

Department of the Army requirements dictate the classification of Army aircraft currently in use into three separate categories:

Three Categories

1. Two-place fixed-wing, which includes the following: (*a*) L-4 series, fabric-covered, 65 horsepower, gross weight 1,250 pounds; (*b*) L-5 series, fabric-covered, 185 horsepower, gross weight 2,150 pounds—both of these are reconnaissance-observation types used during World War II; (*c*) L-16 series, fabric covered, 90 horsepower, gross weight 1,500 pounds (Fig. 3), used primarily as a training plane and as an interim tactical airplane; (*d*) YL-15, all metal, 125 horsepower, gross weight 2,100 pounds. This is a postwar aircraft in service-test stage developed by the Air Force as a possible tactical aircraft to meet military requirements (See top of p. 24).

2. Multipassenger fixed wing: L-17B, all metal, retractable landing gear, 205 horsepower, gross weight 2,750 pounds (Fig. 2)—a postwar 4-passenger "staff-car" type assigned to division, corps and army headquarters as a utility type.

3. Rotary wing—helicopter. Because of the great military potential of the helicopter as a special purpose aerial vehicle to supplement fixed-wing aircraft in mountain, jungle, or arctic operations, the utilization of this type has been recognized and authorized for use as organic Army aviation equipment. The vertical-flight characteristics and the inherent hovering and slow-speed-flight ability of the helicopter make it adaptable to a variety of military uses.

At present, two types are in use: (*a*) H-13B, 2-place observation vehicle with auxiliary provisions for emergency aerial evacuation, 178 horsepower, gross weight 2,172 pounds (Fig. 1); (*b*) YH-18 (service test), dual-purpose utility type, four passengers or equivalent in useful military load, 245 horsepower, gross weight 2,700 pounds.

These, with the other aircraft types in development, including jet-powered prototypes, provide an array of equipment which is a provocative addition to the Ordnance family.

Air Force

Tactical Air Support

Air Force Fighter-Bombers Are Ready To Back Up the Army Ground Forces

by

Col. Philip Schwartz

"THE United States Air Force is so wrapped up in the concept of strategic bombing and in furthering its own ends through unilateral action that it is neglecting the development and improvement of tactical wartare methods necessary to the air support of ground troops."

Such is the current talk of people who should know better, both in and out of the military service. The speaker usually contends that the Air Force does not have, and is not procuring, the type of airplane which was such a necessary adjunct to General Bradley's and General Patton's sweep across Europe in 1944 and 1945.

What kind of airplanes did Bradley and Patton depend on? The F-47 Thunderbolt and, to a lesser extent, the F-51 Mustang were the principal fighter bombers of the Second World War. Originally equipped for gun shooting, bomb racks and rocket launchers were mounted on them during the war; thus they became fighter-bombers. During combat the ground forces radioed to the fighter-bomber pilots the location of enemy obstacles in their path. Proceeding to the target area the pilots dove on it, firing machine guns, dropping bombs, or shooting rockets.

Due to the fact that we had little experience in using fighter airplanes for dive bombing and because there was much that we did not know about the new rockets, neither bombs nor rockets hit as close to the target as desired. Most of the damage to enemy installations accomplished by fighter-bombers was done by machine guns which accomplished with volume of fire what the smaller number of bombs and rockets were frequently unable to do.

1,800 Rounds

Fighter-bombers had only 2 bomb racks and could carry only 2 ordinary bombs; rocket launchers could not carry more than 10 rockets; but each of the 6 machine guns was equipped with an average of 300 rounds of ammunition, making as many as 1,800 rounds available per airplane. Each machine-gun round of ammunition might have an incendiary load which could start a fire.

It is quite possible that the aircraft rockets accomplished the least damage, bombs a little more, and machine guns the most, notwithstanding the stories broadcast by the rocket inventors concerning the remarkable efficiency of rockets.

Deficiencies in machine-gun sights were recognized as they arose, and corrective steps were initiated. A computing sight equipped with gyros was being installed in all fighters during the latter part of the war. This was a big improvement over the prewar ring-and-bead type of sight which was adequate for short-range direct fire but was not adequate for longer range or deflection shooting.

Since the end of the war a new electronic type of sight has been installed in many fighters. Although this electronic sight has not yet been completely perfected, every one agrees that it has potentialities which no other previous

Recent bombing and gunnery accuracy tests show that our airmen are ready for their close-support role as well as for strategic bombing

fighter sight has had. It allows for variables such as relative motion of the target, range to target, and ballistic factors such as gravity drop of the bullet, bomb, or rocket.

"Flying Machine Guns"

When the General Headquarters Air Force was activated in 1935, it announced that fighters (or pursuit airplanes as they were then called) were primarily flying machine guns and anything which did not contribute to the mission of the flying machine gun must be removed from the airplane in order to lighten it for greater maneuverability. Accordingly, bomb racks were removed from fighter aircraft in 1935 and were not restored until World War II began.

The need for training pilots in aiming bombs was forgotten to such an extent that it was not until late in World War II that fighter pilots being trained in the United States were given training in dive bombing. Many of these had to learn how to aim bombs after their arrival in the combat theater. Rockets were in a similar category, and the first Army Air Force fighter group firing of rockets was accomplished in the combat theater.

When the V-1 buzzbomb was first fired at London by the Germans in June 1944, the U. S. Air Forces in Europe asked for help from the United States to combat these missiles. Because the V-1's were fired from the so-called "rocket sites" (the V-1 is a pilotless aircraft, not a rocket) on the north coast of Europe, the first reply to the request for help against the V-1 was an air shipment of 5-inch HVAR's (high-velocity aircraft rockets).

It was assumed that fire could be fought with fire and that rocket sites could be destroyed with rockets. Unfortunately the rocket sites were heavily constructed of stone and concrete, and the 50-pound head of the "Hi-Var," filled with about seven pounds of TNT, could do little damage to them. The Hi-Var's were used against targets in Continental Europe for only a short time before it was decided that bombs containing fifty per cent or more of high explosives would be more valuable.

The next target selected for Hi-Var's was the tank. Before going to France one group of the Ninth Air Force practiced shooting at tanks on a piece of land in the Thames estuary. But the rockets were not too successful when fired at enemy tanks because it was difficult to hit such comparatively small targets. About this time it was realized that the incendiary bullets of aircraft machine guns could set fire to a tank by entering openings designed to provide air for the tank engine.

The initial enthusiasm for rockets gave rise to many stories, conveniently unverifiable, about the number of tanks hit and destroyed by that weapon. One story current during the war was to the effect that if the rockets scared the enemy half as much as they did the pilot who fired them, they must be very efficient. Ninth Air Force operational analysts later found by examining captured areas in Europe that aircraft had not accomplished much damage to tanks.

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Gunnery Competitions

What is the Air Force doing to prepare to give help to the Army in the next emergency? In 1947, when the Air Force was beginning to recover from the hasty postwar demobilization period of 1945-1947, the writer, together with a few other officers cognizant of the importance of accuracy in bombing and gunnery, began to discuss the desirability of reviving the fighter gunnery competitions which existed before World War II. In 1948 active plans were initiated for such a competition.

Incidentally, it was about this time that the American Ordnance Association seriously considered offering a trophy to the Air Force to be awarded to the fighter organizations and fighter pilots who made high scores in the proposed competition. (Before World War II the Luke Trophy was periodically awarded to a fighter pilot for excellence in fighter gunnery.)

In May 1949 the first postwar fighter gunnery meet was held at Las Vegas Air Force Base, Nev., for teams representing fighter groups based in the United States. Las Vegas was selected as the place for the meet because of the availability of air-to-air and air-to-ground range facilities in the near-by thinly populated areas and because of the good weather which normally exists in the vicinity.

The 1950 Meet

The 1949 meet was so successful in awakening interest in fighter gunnery equipment and training that another competition was scheduled for 1950. In the latter part of 1949 commanders of almost all regular fighter groups met in Washington to make arrangements for the 1950 meet. It was agreed that teams of three pilots would be entered from groups stationed in this country, overseas, and from the Air National Guard. Decisions were made concerning kind of target, kind of ammunition, tow-target speeds, foul lines, sights, rocket launchers, scores, and many other pertinent factors.

An arbitration committee consisting of carefully selected fighter pilots not directly connected with any of the competing teams, in the grades of colonel and lieutenant colonel, was selected to rule on all disputed points.

This writer visited several fighter bases in the United States during February 1950 and found that extraordinary interest had been aroused by the proposed meet. Group, wing, and air force commanders did everything physically possible to make their teams ready to win the Las Vegas contest. Elimination contests were held in the fighter groups. Bombing and gunnery ranges were improvised by base commanders where none had existed before. Shooting-in butts for bore-sighting and harmonizing aircraft machine guns (testing guns to make certain they shoot and are pointed properly) were constructed by base commanders, sometimes without the extensive financial help normally considered indispensable.

At Eglin Air Force Base three groups

were observed conducting elimination trials in February. They were so anxious to win that they did not like to tell each other what scores they were getting and what methods they were using. Fighter group personnel were sent hundreds of miles to camp at gunnery ranges under elementary housing conditions in order to be able to concentrate on improving the gunnery accuracy of those pilots who were being considered for the group team. Groups using the new electronic sight believed they had an edge on the others, and one group reported that its pilots were sometimes obtaining an almost perfect score. Groups using the older K-14 sight became worried and sent counter rumors flying around the country concerning their almost perfect scores.

When the contestants finally arrived at Las Vegas during the latter part of March 1950, nineteen teams were present, of which two were from Germany, two from Japan, one from Alaska, two from Air National Guard groups in the United States, and the balance from regular fighter groups stationed in the United States at places as widely apart as Massachusetts, Georgia, Texas, Southern California, Washington, and Michigan.

Six aircraft types were entered in the meet: F-80, F-84, and F-86 in the jet class and F-47, F-51, and F-82 in the conventional (piston-engine) class. Interest was definitely at an extremely high pitch. When the shooting started the arbitration committee began work promptly and was kept busy throughout the meet.

From March 29 to April 4 the first attack on the targets was scheduled each morning for 5:55 A.M. It was necessary to get up at about 3:30 A.M. in order to see the first shooting at the air-to-ground range which was located at Indian Springs, about forty miles from Las Vegas Air Force Base.

Excellent Arrangements

The arrangements at the air-to-ground range were excellent for both official observers and unofficial observers from the near-by towns. A representative of Army Field Force headquarters who was present stated that Army personnel could learn much from observing the tactics used and the results at the air-to-ground range. The Army Field Force representative rode as a passenger in an F-82 during one of its missions against ground targets and was greatly impressed.

Air Force

Range personnel are shown above scoring a ground-panel target during the second annual gunnery meet at Las Vegas Air Force Base, Nev.

In addition to the air-to-ground range the most popular places were near the scoreboard and around the large table where the towed flag targets were scored. All team members, both air crews and ground crews, watched these activities carefully and showed by their remarks and their appearance that they took the results seriously.

Group and wing commanders (all team group commanders were present and some wing commanders) carefully watched developments as they occurred. Group commanders showed their interest in the meet by having a separate part of the competition for group commanders only, and the group commander making the highest score was awarded a trophy.

The Chief of Staff of the Air Force, Gen. Hoyt S. Vandenberg, made a special trip to Las Vegas during the competition as did Lieut. Gen. Ennis C. Whitehead, the Commanding General of the Continental Air Command, and Lieut. Gen. Curtis E. LeMay, the Commanding General of the Strategic Air Command. Airplane companies, engine companies, sight manufacturers, Air Matériel Command, Springfield Armory, Office of the Chief of Ordnance, and Headquarters, U. S. Air Force, sent representatives. Civilian technicians present helped to keep airplanes and airplane equipment in tip-top shape in order to eliminate reduced scores due to mechanical failures. The Ordnance representatives carefully examined all reported malfunctions of guns and ammunition. The troubles encountered in the newly adopted electronic sight kept sight manufacturers' representatives busy.

Gun Cleaning

The necessity for cleaning guns carefully before each 20,000-foot-altitude mission caused much talk about the effect on boresighting of gun removal for cleaning and the need of reboresighting at the shooting-in butts. Because only one shooting-in butt was available, some teams chose not to remove their guns and improvised gun-cleaning methods.

The best gun-stoppage rate during the meet was one in 1,200 for the winning team; the poorest stoppage rate was one in 600 rounds for the team which placed second in the jet class. It is possible that this second-place team would have had the high score if its stoppage rate had been as good as that of the winning team.

One of the wartime gun sights gave

as good results as a postwar sight design, much to the dismay of its inventors, manufacturers, maintenance personnel, and pilots who used them. Foul lines were used to improve safety conditions and to increase the range of shooting—the increased range made hitting the target more difficult. Special locally improvised spotting instruments for measuring altitude of bomb release and for spotting bomb and rocket impacts on the target were used. Plotting boards were also improvised. Similar equipment and spotting methods for all gunnery and bombing ranges are now being given consideration.

A new method of scoring bombing and rocketry was used. This method employed the distance in feet from the aiming point as the yardstick of accuracy. The previous method involved scores based on hitting inside or outside circles of fixed radii so that the difference between a good score and a bad score might be caused by a difference of only a few inches in the point of impact.

The towed target used for air-to-air gunnery became brittle when used at high altitudes because of the low temperature. It frequently came back with twenty-five to fifty per cent of its length broken off. Some missions were reflown because not enough of the target had come back to obtain a score and the arbitration committee was compelled to rule on target matters more than once. Flag targets were towed at 12,000 and 20,000 ft. altitudes by B-26 airplanes furnished by Air National Guard squadrons. Air National Guard crews manned the towing B-26's, and during the trophy presentations at the end of the meet were given a vote of thanks for their good work by the competing teams.

The local jet team representing Las Vegas Air Force Base made the high team score for both classes. A team from Otis Air Force Base, Mass., was second in the jet class, and a team from Bergstrom Air Force Base, Tex., obtained the high team score for the conventional (piston engine) airplane class. The commander of the Misawa, Japan, group made the high score for commanders of jet groups. The commander of the Neubiberg, Germany, group made the high score for commanders of conventional groups. The two Air National Guard fighter teams, one in the jet class and the other in the conventional class, although not among the winners, made a respectable showing.

More Armorers Needed

Many ideas for improving fighter gunnery were expressed during the discussions which went on from dawn at hangar lines and ranges until the late hours over beer at the officers' and noncommissioned officers' clubs. One of the conclusions reached was that for concentrated gunnery periods more armorers are needed by fighter squadrons. Gun stoppages and malfunctions in sights, rocket launchers, and bomb racks decrease as the number and quality of the armorers increase. Las Vegas Air Force Base is writing a detailed report containing recommendations for improving fighter airplanes and accessories, fighter pilots, fighter gunnery, and future meets. Individual observers also wrote reports.

Both "Portrex" in the Caribbean and "Swarmer" in the Carolinas are examples of exercises involving cooperation between surface and air forces which have taken place in recent months. Air-ground exercises in Alaska have also been widely reported in the newspapers and magazines. No such series of strategic bombing exercises has recently received the attention of the public. How can any one say that we are not paying enough attention to tactical support of armies if we have had three important tactical air-ground exercises described in the newspapers during the last six months while not one exercise involving strategic bombers has been brought to the attention of the public?

In the way of actual support the Army wants from the Air Force:

1. Superiority in the air above our ground forces so that enemy airplanes can be kept from attacking them.

2. Superiority in the air above enemy ground forces so that we can attack them through the air when necessary.

3. Ability to use aircraft weapons such as bullets, bombs, and rockets for destroying enemy strong points that are holding up the advance of our ground forces and for delaying the enemy advance when our forces are retreating.

4. Ability to isolate the battlefield at the proper time by destroying bridges, railroads, and roads to prevent enemy reinforcements being transported to the front.

5. Airplanes for paratroop drops and for hauling airborne infantry in airplanes and gliders.

6. Airplanes to carry organizational equipment and supplies to airdromes near the front.

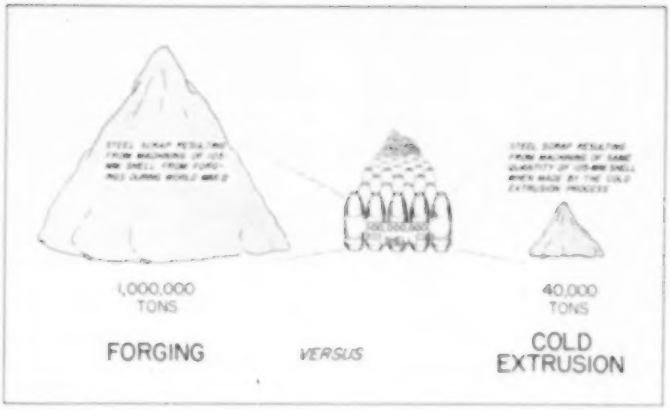
7. Firepower to weaken enemy rear areas by destroying enemy transportation, industry, economy, and morale.

In December 1944 when the U. S. Air Force was at its peak strength during World War II, the proportion of strategic bombers overseas in all theaters was about twenty-four per cent; the balance was in fighters, transports, and medium and light bombers, all of which are of primary interest to the ground forces. Fighter-bombers and transports accounted for more than fifty per cent of all United States Air Force aircraft overseas.

Fighters Outnumber Bombers

The proportion of strategic bombers in the whole U. S. Air Force in 1949 was even lower than in 1944, and the proportion of airplanes of interest to the Army (fighter-bombers and transports) again accounted for more than fifty per cent of our 1949 aircraft strength. It must also be recognized that we have more fighter groups in the regular Air Force than bomber groups, and, in addition, we have fighter groups in the Air National Guard about equal in number to those in the regular Air Force.

These figures are proof that the Air Force is not neglecting preparations to support the Army. A Congressional Committee reported in 1949 that the present Chief of Staff of the Army "expressed full satisfaction with existing plans for the air support of the Army by the Air Force."



Cold Extrusion of Steel

A Metal-Fabricating Process of Great Importance to Ordnance and Industry

by

Col. Merle H. Davis

Chief, Industrial Division, Office of the Chief of Ordnance, Department of the Army

Superior steel products and great savings are outstanding contributions of this new method of shaping

THE shaping of steel by cold extrusion is not new in the metal-fabricating industry of this country. We continue to find individuals who have shaped steel in this manner for years and who did not regard themselves as pioneers. However, since V-J Day there has been a mounting interest in the process. Unfortunately, along with that interest there has been a lot of mystery. Many people have gotten the idea that Army and Navy Ordnance have established some sort of coterie or closed circle with a few manufacturers and that the accomplishments obtained from our development contracts are not going to be available generally to the stamping industry.

Just the opposite is true. If the process has merit for more extensive commercial application, the industry should know as much about it as we do and should be using it. Otherwise, the two Ordnance services will never be able to realize fully in wartime the potentialities we think are there for the taking.

A 105-mm. cartridge case made by cold extrusion and one deep draw from a 3-inch billet of hot-rolled bar stock.

If any manufacturers have a commercial product that is a rather thick-walled steel cup or any hollow cylinder that may or may not require additional shaping, particularly after extrusion is accomplished, and if fairly high physicals are needed in the final end product, we hope they will scrutinize the economies that may be available.

If it looks good to them, we hope they will give it a try; then if they care to take us into their confidence, at least to the extent that we know of their effort and degree of success, they will be helping us.

What follows are the essential facts that we have learned about the cold-extrusion process.

Essential Facts

Although cold extrusion involves the use of punches and dies, it should be pointed out in the beginning that extrusion differs basically from drawing. During drawing, the workpiece is formed by the application of tensile stresses, whereas in extrusion the piece is forced to flow as a result of applied compressive stresses.

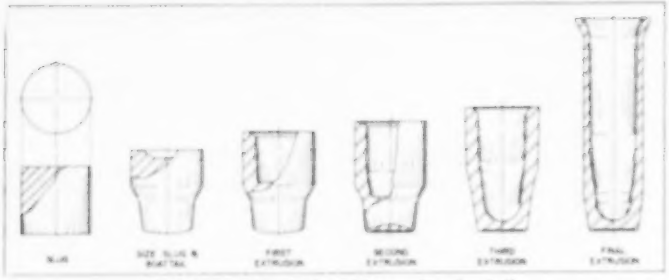
The extrusion of metals is accomplished by two types of operation, backward extrusion and forward extrusion.

Backward extrusion (hot or cold; aluminum, copper, brass or steel) forces the metal to flow in a direction opposite to the travel of the punch and is in general an operation of converting a solid cylinder into a cup. Basically it differs little from the method of piercing billets or bar in the first operation of the conventional pierce-and-draw method of making shell forgings.

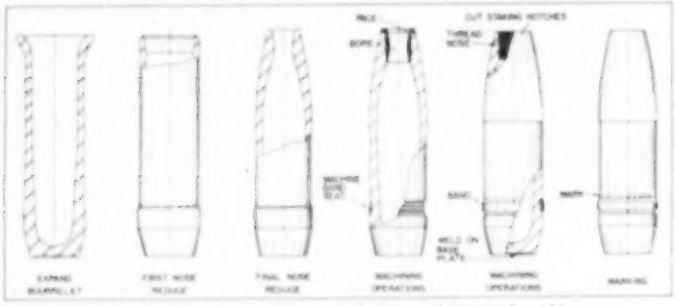
During *forward extrusion* the steel flows in the same direction as the punch. It flows out of the die ahead of the punch at a greater speed than the ram is traveling, the increase in speed being proportional to the reduction in cross-sectional area. The forward-extrusion operation is quite analogous to the squirting of grease from a hand grease gun.

A Technical Industrial Intelligence Committee, under the joint sponsorship of the military and the Department of Commerce, visited Germany immediately after the war. One thing that im-

• **Colonel Davis was invited to initiate the discussion and to present a summary of present knowledge of this subject in a seminar on cold extrusion before the Pressed Metal Institute at the Hotel Carter, Cleveland, Ohio, March 17, 1950. His remarks aroused widespread interest and considerable comment in the business and technical magazines of the country. He was invited by the Editors of ORDNANCE to restate them in this article.**



Typical operations in the cold extrusion of a shell.



Final steps in shell manufacture, including machining and marking.

pressed them was the widespread practice of the cold extrusion of steel. It appears that about 1934 the German Government called together the manufacturers of steel cartridge cases and told them to develop the best method of making them.

A foreman from one company proposed the idea of extruding rather than drawing these cartridge cases. The company apparently had tried it during World War I but had been unsuccessful because of lack of good steel for tools and workpieces. The method as finally worked out by Nuemeyer involved a combination of extrusion and drawing. One extruding operation, after cupping, replaced two draws and one annual pickle-bonderize in the conventional manner. This method was adopted and used by many of the steel cartridge case manufacturers.

So far, military applications of cold extrusion have been limited to hollow cylinder shapes because all investigations have been directed toward ammunition applications. However, the cold extrusion of steel rods and solid shapes is feasible and may warrant investigation. Forward extrusion of hollow cylinders must be preceded by cupping by any means, including backward extrusion.

The cup is then placed in a die setup which restrains it laterally but has a restricting ring die opening in the bottom. The punch has a pilot or plug which fits inside the cup. The punch applies pressure to the rim of the cup, and the metal is forced to escape downward through the annular orifice between the ring die (on the outside) and the plug of the punch (on the inside).

Saving Steel

In the manufacture of artillery shell, cold extrusion will have its prime advantage in saving of tons of steel (see illustration on p. 31.) The consumption of high-grade steel for artillery shell represents a far larger percentage of the total steel used during war than most people realize. The savings we are now experiencing in the 155-mm. shell (from six to twenty pounds' wastage reduced to one pound or less) means that we may look forward to as much as a forty per cent reduction in our shell-steel needs. At a peak point during the war we were using 160 carloads of shell steel a day for 105-mm. and 155-mm. shell alone.

Another advantage of only slightly less importance is the saving in machining operations. Three simple machining operations are the most we would need on an extruded shell body. These are to cut the band seat; to face, bore, and thread the nose; and, finally, to nick the staking notches. A relatively simple single-purpose machine could probably do the whole job in one setup.

Still another important advantage is that we can use low-carbon, low-manganese steel and still get the necessary physical properties by cold-working. We have no need for the 0.90 to 1 per cent manganese that Army Ordnance now requires in shell-forging stock for machinability and hardenability.

Improved Accuracy

With cold extrusion we expect a dividend of improved accuracy from the superior surface finish. We expect another in the high degree of concentricity that is present in an extruded shell. Where we must permit a surface roughness of 250 to 500 microinches RMS on a conventially machined shell, cold-extruded shell have the same smoothness as the die.

This smoothness will give our shell greater range and a reduced dispersion. With the improved concentricity that comes with cold extrusion our shell will travel more steadily through the air. A shell spins about its axial center of gravity with a high rotational velocity, and when the cavity is eccentric to the outside it means that the shell will spin about a point different from its geometric axis.

Cold extrusion will give us less variation in weight, and that simplifies problems for both Ordnance and the artilleryman. When shell are made from forgings there is such a variation in the weight that we must set up weight zones. After the shell are filled with high explosive we must weigh each one and mark on it the weight zone. The field artilleryman must adjust the elevation of his weapon for the zone weight marking on the nose of the shell. When the cartridge case is tightly crimped to the projectile, as in antiaircraft or tank ammunition, Ordnance

must, at the time of assembly, adjust the amount of propellent powder to compensate for the differences in weight. We believe that cold extrusion will give us shell of such consistent weight that they will all fall into one weight zone.

Still another advantage, yet to be fully explored, is the possibility that we will not require the same high standards of cleanliness and soundness demanded in shell-forging stock. We know that the kneading action that takes place during an extruding operation breaks up to some extent the inclusions, porosity, and stringers. How much this will permit us to relax our cleanliness and soundness standards we have yet to see, and already there are wide differences of opinion.

Economical Process

In applying the cold-extrusion method to steel cartridge case manufacture we have similar advantages in mind. Where drawn cartridge cases are made from plate, disked, cupped, and then deep-drawn in several operations, we are now starting from bar, in itself a cheaper item. In forming the first piece we lose only the width of a hand-saw cut, whereas we customarily get a yield of but fifty per cent in cutting disks from plate.

Before cupping and drawing, a disk in most cases is given a long and costly spheroidizing anneal to keep down scrap loss during cupping and drawing. Before extruding a slug cut from bar we will have to give it only a process anneal or a conventional normalizing operation at the most.

The saving in operation which we can get from cold extrusion has been well demonstrated by the 20-mm. steel cartridge case processed pieces made by Stoner. Stoner, a small but successful small-case producer of World War II, has backward-extruded a deep cup from a hot-forged slug, followed it with one forward extrusion and one draw.

By the conventional cup-and-draw method this case would have required four to five drawing operations after cupping. This is of course followed by the conventional trimming, heading, tapering, necking, and machining operations for both methods.

Other advantages especially applicable to steel cartridge cases are the high physical properties that we get from the cold-extruded pieces. It also seems we get a greater elongation from a cold-extruded structure than is normally found by cold drawing to the same strength. This means that in some instances only a low-temperature stress-relief anneal is all the final heat treatment we need. We are still far from sure that this is the best way to make 20-mm. cartridge cases, but the accomplishment is significant.

First Contract

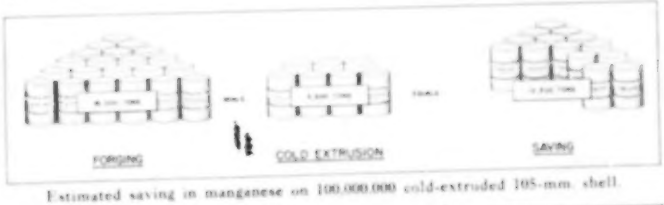
The first Government investigation into cold extrusion was through an Army Ordnance contract with Heintz Manufacturing Company "to have the contractor furnish the Government certain shell and burster casings manufactured by the cold-extrusion method as developed in Germany and investigate the method thereof thoroughly." This contract entered into in June 1946 was completed in July 1947 with the submission of the company's Summary Report and a small quantity of 20-mm. M97 HE shell and M1 burster casings. The contractor was furnished a triple-action German Schuller press as well as the services of three German specialists: Dr. H. Kopp, Dr. Ludwig Schuster, and Hans Fischer.

This work was later supplemented by another contract whereby the Heintz Manufacturing Company applied the techniques they had learned to a 5-inch rocket motor and an experimental 75-mm. projectile. The intent of this project was to investigate the application of cold extrusion to larger work pieces and higher carbon and alloy steels. We also desired to know the amount of cold reduction obtainable within a single extrusion operation and the physical properties resulting therefrom.

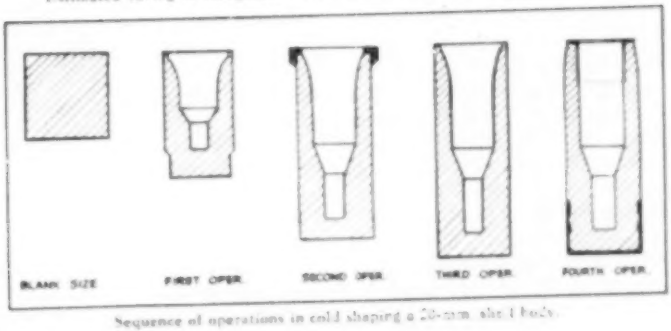
During the development of an experimental 65-mm. high-explosive projectile two years ago, the Mullins Manufacturing Company applied the principles of cold extrusion to the shaping of the shell body. At a later date, the same company manufactured an 81-mm. mortar shell body by cold extrusion. Soon after, the Norris Stamping & Manufacturing Company used cold extrusion for the manufacture of a component of an experimental mortar shell.

These accomplishments on various experimental ammunition items only paved the way. The time had come to try cold extrusion seriously on one of our important standard projectiles on which we had amassed vast information in World War II manufacture by conventional methods.

We placed with Mullins an order for



Estimated saving in manganese on 100,000,000 cold-extruded 105-mm. shell.



Sequence of operations in cold shaping a 20-mm. shell body.

a pilot lot of projectiles for the 105-mm. howitzer. They have already passed all ballistic and metallurgical tests, but much more extensive tests are to follow. The success achieved led us to install at Mullins a special 3,000-ton long-stroke high-speed hydraulic press, equipped so that it is in fact a laboratory tool for determination of optimum extrusion speeds as well as the pressures required. Navy Ordnance went in with us and placed an order in the same plant for their most important antiaircraft projectile, a shell sufficiently different from the 105-mm. shell in design to give us much more information on the potentialities of the process.

More Design Data

The press just mentioned will also be used on an important rocket body and on a larger projectile. That press will allow us to determine definitely and accurately the effect of higher ram speeds on the pressures required and on life of our dies. From these results we should be able to formulate the design data for presses that will be best suited to extrusion operations. As time goes on we shall make more and more basic data available to all the press manufacturers and to our potential contractors for shell and similar items.

Other companies are currently participating. Heintz, for example, is making a 105-mm. steel cartridge case starting from bar stock. Although the Germans used extrusion extensively in steel cartridge case manufacture, the largest case they made from bar was a 40-mm. Their larger cases were made from disks cut from plate. In our thinking, extrusion in the fabrication of the larger items is hardly worth while unless we can start from bar.

I have already mentioned the 20-mm. cartridge cases being produced experimentally by the Stamet Manufacturing Company. In addition, the Metrolux Corporation is in the process of making an experimental rocket motor and head in one piece by the cold-extrusion process, while Norris is using cold-extrusion techniques in making the cup for a Navy steel cartridge case.

In developing the optimum method of fabricating the 105-mm. steel cartridge case, Frankford Arsenal is investigating the applicability of forward extrusion to replace drawing operations, and National Machinery Company is working with the arsenal on the backward extrusion of cups.

Application of the process to small items such as this caliber .50 case or to small fuze and primer items may not be so spectacular or so impressive in the saving of steel as fabrication of a larger artillery shell, but at least such operations can be accomplished on light presses everywhere available.

Process anneals are being investigated by all the current manufacturers. We do know already that we require fewer process anneals than in conventional cup-and-draw methods yet we do not know how far we can go in eliminating these intermediate anneals. The possible savings that can perhaps be derived in plant space, equipment cost, and expenditure of gas or oil is almost as great as that for the actual forming operations.

Ordnance has concentrated most of its attention on low-carbon steels. Very little attention has so far been given on our contracts to the cold extrusion of high-carbon or high-alloy steels.

The size of the stakes for which we are playing is evident. We continue to be amazed at the apparent ease with which we can cold-extrude steel. So long as our punch and die design is sound, the metal goes where it should. Optimum conditions for ram speed and for lubrication of the work must exist, but the zones for entirely successful operation are certainly not narrow.

A Warning

But a note of warning must be introduced. We have not yet extruded enough projectiles to have all the answers. In this warning I am only echoing those of the chairman of the Shell Committee of the American Ordnance Association, Walter N. Howley, an artillery shell manufacturer of long experience. It is his fear that the obvious advantages of the extrusion process and the fantastic savings that seem already within our reach may lead his old Ordnance friends to hasty decisions for which they may later be sorry.

> **"The underlying philosophy of the Shell Committee is that industry must consider the future not only as requiring production for peacetime needs but also for wartime demands. It is our hope that managers of plants making similar products to those used by the Ordnance Department will consider it good business to accept this dual responsibility.**
>
> **"While we are following the methods that must be used if any emergency arose in the next few years, new methods are not being overlooked, nor do we overlook the tremendous responsibility that rests upon the individual Army officers who make determinations regarding the products that show great promise but require great gambles. Cold extrusion of shells is a good example. This cold extrusion could change our thinking regarding shell making, but it presents tremendous risks and it requires great development."—** WALTER N. HOWLEY, *Chairman, Shell Committee, American Ordnance Association, at Industrial Orientation Conference, Washington, D. C., February 15, 1950.*

Admittedly there are two things which continually dampen our enthusiasm for this subject. First, large presses of sufficient length of stroke and, more importantly, presses with sufficient working space for efficient removal of long forward extrusions are scarce items in the stamping industry.

Moreover, every sign points to the fact that the procurement of new press equipment will be more critical in a future emergency than in World War II and will require a more rigorous application of priorities. Faced with this situation, we are not discarding the shell-forging and machining equipment tucked away in our tool reserve.

Finally, the cold-extrusion process is not yet in important use on steel commercial products. The pressed-metal industry has had little or no experience with it. That is a deterrent as serious to us as the shortage of the right kind of press equipment. I hope it is a deterrent that will disappear.

Scientists in Reserve

How To Keep Our Technically Trained Men Interested in the Military Arts

by

Dr. L. L. McQuitty

There is a need today of officer-scientists who can interpret the importance of modern discoveries to the military profession

All wars have demonstrated the significant rôle played by new developments in determining the final outcome. More and more have we come to depend upon scientists and science for these developments. Each war brings many scientists to the defense of their country, but few of them retain interest in military matters once the war is over. The great majority of these civilian officers and men in uniform return to a state of lethargy with respect to the vital matters of national defense.

If scientists are to be kept interested in military activities an effective Reserve program is a definite necessity. Such a program must stress the relationship of science to military matters. Mere training in military routine and organization is not sufficient to keep scientifically trained individuals interested in the retention of their Reserve status. Scientists and engineers are professional men. They will retain interest in military activities only if their civilian professional qualifications and abilities are utilized.

There is no question but that the rapid pace of science has left many career military personnel bewildered and asking the question: "How will the many new scientific and engineering developments change the heretofore conventionalized modes of offensive and defensive warfare?" There is obviously a need for a group of officers who are not only scientists and engineers but who, because of their military experience, are able to interpret the importance of modern discoveries to the practitioners of the military profession.

Reserve Scientists Needed

It is readily seen that Reserve-officer scientists and engineers are peculiarly fitted to accomplish just such a mission in the present-day national-defense organization. Carefully selected Reserve-officer scientists and engineers are needed to effect such liaison. They are needed to bring civilian scientific research and engineering development into correlation with military and national-defense requirements.

To be effective, such technically trained Reserve officers must have achieved professional standing by demonstrated ability and accomplishment in their fields of specialization. It is equally important that Reserve-officer scientists and engineers be accorded a greater degree of confidence by personnel of the Regular military establishment than they have enjoyed thus far.

Technically trained Reserve officers can and should constitute a vital link in the national-defense man-power set-up. They are in a strategic position to effect liaison between civilian and military science because of their professional background and experience and

Dr. McQuitty, a colonel in the Adjutant General's Department Reserve, is commanding officer of the 5000th Research and Development Training Unit and associate professor of psychology at the University of Illinois. He was assisted in the preparation of this article by Maj. L. F. Audrieth, Ordnance Reserve, executive officer of the unit and professor of chemistry at the university.

their military status and training. But to keep such Reserve-officer scientists actively interested in national defense it is necessary to encourage specialized training programs designed to emphasize the professional aspects of military science. Outstanding is the program which has been developed at the University of Illinois in cooperation with the Logistics Division of the War Department General Staff for meeting these particular specifications and requirements.

The first effort toward the development of a Reserve military program for scientific personnel at the University of Illinois was made in the fall of 1946 by Capt. H. H. Thornberry, A.G.D. Reserve, and an associate professor of plant pathology in the horticulture department of the university. After informal talks with fellow Reserve-officer scientists and with Lieut. Col. Don W. Dixon, F.A., senior Army instructor, a meeting of scientific Reserve personnel was called at the Champaign, Ill., suboffice of the Officers' Reserve Corps. A committee was appointed to give further study to a number of proposals and to make recommendations.

A questionnaire was sent to all scientists in the University of Illinois area who had served as military personnel in the Second World War. Replies indicated that a substantial number were interested in setting up a program of military training especially adapted for scientific personnel. A provisional organization was then established under the guidance of Colonel Dixon.

The support of President George D. Stoddard of the University of Illinois was solicited in an effort to obtain official recognition from the Department of the Army. Direct contact on the part of President Stoddard with the Secretary of the Army in our behalf led eventually to the activation of the 9900th Research and Development Training Unit at Champaign-Urbana, the home of the University of Illinois.

Tentative Objectives

The tentative objectives for the provisional scientific unit at the university are embodied in the following declaration of aims and purposes of the group:

1. To provide military orientation for scientists as a means toward achieving more effective cooperation and understanding between scientists and military personnel.

2. To offer military scientific personnel in each of several scientific fields an opportunity to become familiar with the military applications of other basic branches of science and engineering.

3. To select and provide military orientation for interested and well-qualified young scientists to the end that they will be prepared to apply their scientific capabilities to the national-defense effort in case of an emergency.

4. To set up a roster of scientific military personnel emphasizing special qualifications and abilities of such individuals.

5. To espouse the principle that scientific personnel in this area be called to duty on the basis of their qualifications and demonstrated ability.

6. To suggest a more stimulating program of military training for scientists, involving such activities as active-duty conferences on military chemistry, military geography, military psychology, and related subjects.

7. To develop a local Reserve military-training program covering conferences, lectures, and discussions on various scientific topics.

"Able as the nonmilitary scientist may be, he is very apt to overlook the implications of work which is being carried out with a concrete military objective in mind."

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8. To disseminate unclassified scientific information to the public which would be of assistance in the protection of themselves and their property in case of a national emergency.

9. To encourage scientific societies to coordinate more closely with national-defense agencies.

10. To demonstrate to governmental authorities the ways and means by which scientific personnel can serve effectively as consultants on national-defense problems.

11. To encourage the development of similar scientific-military units at other institutions and locations and to coordinate and work with them toward the realization of the purposes outlined above.

12. To strive toward the more efficient application of science in the advancement of the national defense.

These purposes and objectives have guided the program and continue to do so in the present activities at the University of Illinois.

Organization

The administrative organization of the group is similar to that of any other military unit. The staff is composed of a commanding officer, an executive officer, an S-1, an S-2, an S-3, and an S-4. The unit is divided on a professional basis into six subgroups as follows: engineering, biology, chemistry, zoology, psychology, and mathematics.

Each subgroup has a commanding officer who is elected by the members of that particular professional unit and who is directly responsible to the commanding officer of the training group. There are two continuous boards of officers. One of these is the personnel board with the S-1 as president, supported by two members appointed from among the commanding officers of the professional subgroups. This board acts on all major personnel matters such as applications for membership, promotion, and selection of personnel.

A second board is the projects board. The president of this board is the executive officer who works in cooperation with S-2 and S-4 who constitute the remainder of this very important committee.

It is the present policy of the unit that staff members shall serve for only a 12-month period. There are two reasons for this limitation. First, the organization is primarily a scientific organization, and, consequently, none of its members should be restricted by staff appointments to administrative work. Secondly, all scientists need to know certain minimum essentials about Army administrative work. Such military knowledge can best be obtained by actually serving in administrative positions. A turnover of staff every twelve months tends to give this experience to a greater number of

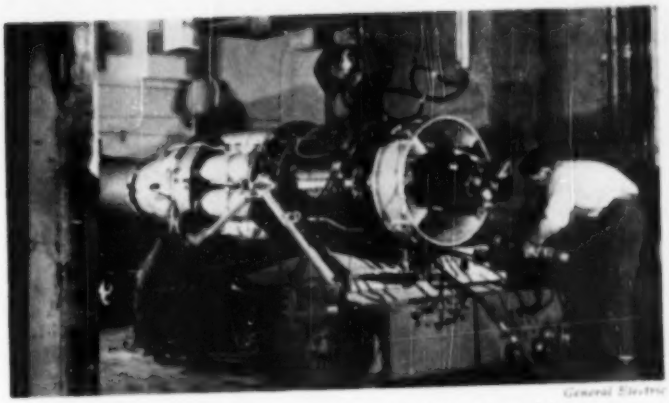
persons. Stability in the organization is obtained by selecting a new staff from among the commanding officers of the professional subgroups.

The unit sponsors general, professional, staff, and public meetings. An effort is made at the monthly general meetings to present material of importance to the military scientist. Necessary matters pertaining to Army administration usually precede presentation of lectures or discussions on more technical matters. Some talks are designed to train personnel of the unit to improve themselves professionally in order to discharge their obligations as military men. Other speakers are invited to address the unit for the primary purpose of keeping scientists abreast of scientific applications in the military services.

Since there is such a distinct trend toward specialization in various scientific fields, it is necessary to keep scientists informed not only of what is going on militarily in their particular professional fields but also to keep them informed of what is going on militarily in the other sciences. Truly effective research and development involves cooperation and teamwork, especially in overlapping scientific fields.

In addition to the unit meetings, decentralized scientific subgroup gatherings are also held. The primary purpose of such professional meetings is to develop and work on various projects which may have been suggested or assigned to personnel within the unit. Some of the projects fall clearly within a specific scientific field. Others, however, demand cooperation between individuals in two or more professional subgroups. Where a project cuts across several sciences, a provisional subgroup is created for the primary purpose of handling a particular problem.

A third type of assembly is the staff and command meeting. The unit commander and his staff meet every week except when the group meets as a whole. The staff and command meeting is attended by the commanding officer, his staff, and the commanding officers of the subgroups. It has served most effectively in keeping up interest and enthusiasm and enabling all parties to feel that they are playing a significant rôle in the policies, developments, and achievements of the group. It is highly recommended as a very useful method for any Reserve group where the personnel are apt to be dispersed except at meeting times.



General Electric

Reserve-officer scientists can be invaluable to America's jet-propulsion program.

High Standards

As previously indicated, unit personnel are very carefully selected. Standards are purposely kept high, for only in this way will a productive effort be forthcoming. Most of the assigned membership (forty-three in number) is drawn from the faculty of the University of Illinois. In academic standing there are included six professors, twelve associate professors, seven assistant professors, and four instructors. Also assigned to the unit are eleven graduate students with World War II experience.

Plans are being formulated to encourage the assignment of young scientists and engineers who have already, during the course of their graduate training, demonstrated exceptional ability in their professional fields. In addition, membership includes a geologist, a petroleum engineer, and a sanitary engineer, each of whom is employed professionally with one of the State Survey Laboratories located at the university.

It should be pointed out that many of the men now assigned to the 5000th Research and Development Training Unit are recognized authorities in their particular scientific fields. Some of them are currently engaged in directing and carrying out Government-sponsored research. Much of this work is being supported financially by the military services. It might be mentioned that this added obligation of conducting research for the military services is undertaken by such individuals over and above their regular teaching and administrative duties because of their abiding interest in national defense.

The 5000th Research and Development Training Unit has given much of its time to a consideration of how scientists and science can be more effectively utilized in the military establishments. Many suggestions are being considered by the local group. Thus, we agree that there must be some method of stock-piling scientists in the event of an emergency so that the military establishment does not misplace qualified men when their talents are sorely needed either in industry or in uniform. It is our conclusion that this calls for a clear-cut plan which must be put into effect when and if the emergency arises. The over-all plan should be applicable not only to scientists in the Reserve components but also to civilian scientists. Such a plan should provide for an uninterrupted flow of military man power.

Responsibility

It would seem that one of the most effective ways of realizing such an objective would be to assign to one of the present research and development units the responsibility for the development of a plan for the proper utilization of scientists in the event of emergency as

well as the responsibility for the execution of this plan should such an emergency arise.

More specifically, it is suggested that the group charged with this responsibility would spend most of its time working out the details of such a plan. In case of an emergency it could then be called to Washington as a unit and incorporated in the Logistics Division of the General Staff to execute its plan under the guidance of high-echelon military personnel.

Obviously, to discharge such a duty it would be necessary for the unit to maintain a constant survey of the Army's needs for scientists in uniform. It should also be well versed in various fields of scientific knowledge to the end that science can be and is best used by the military services. Such a plan would have to be revised continually to meet new situations and new scientific developments.

The group working in close cooperation with the various scientific societies could then recommend personnel to fill technical assignments and see to it that such personnel are effectively utilized. The group, being composed of Reserve officer scientists, would furthermore be in an excellent position to work directly with civilian educational, industrial, and governmental organizations to the end that the nationally significant activities of these be not seriously hampered by withdrawal of scientific personnel for duty with the armed forces.

The problems of science are so many and so peculiar that military personnel cannot effectively utilize science unless there is some centralized office at a high-level military echelon composed of scientists in military administrative positions. It is anticipated that such an office would have liaison officers in each of the technical services in order that the proper coordination could be maintained between the efforts of this administrative office and those in other scientific headquarters.

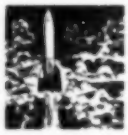
Some consideration has also been given to the possible use of Reserve officer scientific personnel to help keep Regular military personnel up to date on all possible uses of the various branches of science and engineering. There is no question but that the military officer is anxious to use everything that can serve him effectively. It would perhaps be helpful if some of the research and development groups were charged with the responsibility of preparing military textbooks for some of the military schools on the utilization of science and scientists.

Such texts might cover a specific scientific field or, perhaps in a more general way, discuss the whole subject of science in the military field. A book of the latter type might include specific chapters on the applications of chemistry, physics, mathematics, biology, geology, and psychology to the military services. Such a book would not only be interesting and helpful but would also possess cultural as well as public relations value.

Consultative Value

It is necessary, however, to emphasize a still more important activity and one which has not been utilized, except to a very limited extent. Each unit is composed of individuals who are experts and authorities in their respective scientific fields. Many of the Reserve officers assigned to the various units serve as industrial consultants. Others serve indirectly as consultants to the Government in directing Government sponsored research. The consultative value of individuals assigned to research and development units should not be overlooked.

Gathered throughout the country are many military establishments charged with certain research, development, and production responsibilities. Thousands of scientists and engineers are employed under Civil Service at these various installations. However, in this age of complexity, no one scientist can hope to have a complete grasp of all the new developments, even those in his own special field of training, to say nothing of related or borderline fields. It is true that the military services do engage civilian consultants to supplement the scientific talent now employed at arsenals, laboratories, and proving grounds. Every scientist working for an establishment the size of the military services can profit greatly if it is possible for him to discuss his problems with capable scientists in his own field. Able as the non-military scientist may be, he is very apt to overlook the implications of work which is being carried out with a concrete and immediate military objective in mind.



With the establishment of research and development training units such as the one at the University of Illinois, there are now available throughout the Nation men who have had military experience and therefore recognize the value of science to the military services.

Why not make use of the potential abilities and the know-how of such Reserve-officer scientists? Why not give these men an opportunity to work on concrete, specific problems as consultants to those branches of the military services where their background and experience, both military and professional, will be of greatest help?

Only one thing is needed to do so, and that is authorization for scientific-military installations to call Reserve-officer scientists to active duty for consultative purposes for short periods. Maximum advantage at minimum cost could be obtained from such a procedure.

The Army could then obtain the same high-level scientific consultative services at the cost of active-duty pay only, and this is considerably less than that offered to civilian consultants who have less of a grasp, generally speaking, of requirements of the military. This is certainly a national-defense opportunity the Department of the Army cannot afford to overlook.

All who have been concerned with Reserve-officer activities are greatly enthused with the progress of research and development groups. Their success has exceeded our expectations. We are grateful to all personnel of the Regular Army establishments which have borne so great a responsibility in setting up and implementing this specialized program. It is to be hoped that all Reserve-officer scientists may be able to assist them further in an even greater cooperative effort toward the utilization of science in the protection of our country.

ATTACK BY AIR

"Exercise Swarmer," the first tactical application of the strategic airlift technique held recently in North Carolina, showed that United States forces are able to seize an airhead and to launch an offensive supported entirely from the air.

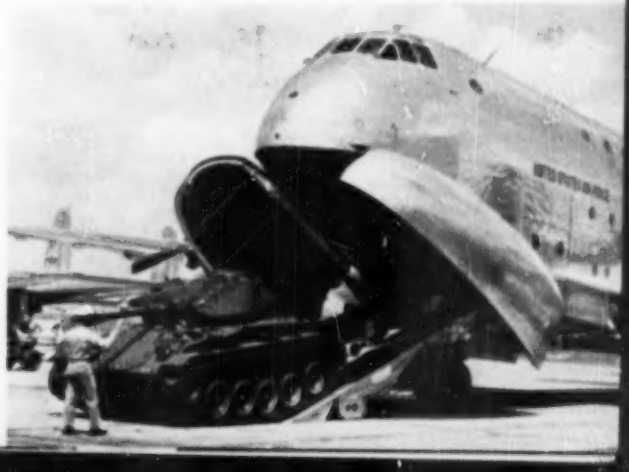
Operating against "Aggressor" forces, U.S. planes dropped or landed 20,196 troops and 11,689 tons of equipment in "enemy" territory in four days. More than 60,000 men and 670 aircraft of 10 types participated in the maneuver.

Among errors disclosed were lack of adequate antitank weapons and failure to name a beachmaster to direct unloading operations. Such weaknesses are being corrected so that our airborne forces will be ready to strike effectively in the defense of freedom (Armed Forces photos).

Heavy weapons, like this 105-mm. howitzer, arrived by parachute.

Paratroopers now carry the 60-mm. mortar and new-type life preservers (left) plus other equipment.

A 24-ton L37 light tank rolls from a C-124A transport at the airhead.



Ground crews ready a 105-mm. howitzer for loading aboard a transport. Lashed to a platform and with a 96-foot parachute attached, the weapon will be dropped to earth and can be made ready to fire within three minutes after landing.

The Fairchild C-119 transport, above, carried heavy ordnance to

Aggressor infantrymen used automatic weapons to good effect.

Navy pilots of Air Group Two helped fly top cover for the attacking forces.

This Aggressor-manned 90-mc

airhead while Packets, right, dropped clouds of men and supplies.

Men of the 314th Field Artillery fire against enemy positions.

un was employed against both attacking aircraft and hostile ground targets.

A newcomer to airborne warfare, the Chase C-123 assault transport got its baptism of fire and proved its worth at Exercise Swarmer.

Second Lieut. W. H. MacMurray (left) calls for air support while observed by Brig. Gen. W. R. Wolfinbarger, Air Task Force commander; Lieut. Gen. J. R. Hodge, Task Force Swarmer commander; and Lieut. Gen. Lauris Norstadt, commander in chief (right).

Maj. Gen. R. M. Lee, Aggressor commander (left), confers with Col. Henry Viccellio, Comdr. C. E. Dickinson, and Col. Harry Henry (right).

Month by Month: High Lights of the National Defense

"Mistakes of the War"

Hanson Baldwin, distinguished military analyst of *The New York Times* in his new little book "Great Mistakes of the War" (Harper & Brothers, $1.50) has performed another singular service to our national welfare. For the first time the broad and far-reaching American errors which influenced the course of the war or affected the peace are set forth succinctly and logically. Quick to admit that it is easy to be wise in retrospect, he boldly follows the wise course that "if we are ever to learn from our mistakes we must identify them."

> *Foremost in his list of the causes of our errors is our painful political immaturity. As in World War I, we had only a catch-phrase target for our great effort. Then we poured out our treasure to "make the world safe for democracy." In our second try we had only some vague kind of a general principle of what the post-war world ought to be like. This time we hoisted high the Four Freedoms, the Atlantic Charter, the United Nations.*

The second great basic fallacy was our one-man personalized foreign policy marked more by idealism and altruism than by realism. In both basic cases we became the victims of our own propaganda.

In turn, Mr. Baldwin puts down and discusses with conviction the great mistakes in Europe and in the Pacific—some of them political, others military. Frequently the basic groundwork for the error was the inability of the politician to act with military realism and as frequently the failure of our military leaders to appraise properly the resultant political consequences. A sterling example of the latter is the tragic situation with which U.S. and allied forces in Berlin are faced today. Too bad no victorious military leader—except the Russian—figured out a suitable corridor for allied ingress and egress to the beleaguered German capital city.

The great mistakes in Europe listed by Mr. Baldwin are: (1) Unconditional surrender—"perhaps the biggest political mistake of the war." (Maj. Gen. J. F. C. Fuller, distinguished British military historian, has roundly denounced unconditional surrender in his "History of the Second World War" and more roundly in the pages of this magazine). (2) The loss of Eastern Europe due to the deep strategic differences between British and American policy makers. "We sought only military victory. The British looked toward peace—victory to them had little meaning if it resulted in political losses" and Overlord—the invasion of Normandy—won out! (3) The loss of Central Europe—not only were we maneuvered by inept statesmanship out of proper access to Berlin but today we find ourselves similarly situated in an equally hot spot at Vienna and one just as hot at Trieste.

In the Pacific the author lists (1) Our failure to develop a politically viable China policy, (2) The Yalta Conference and its "brave-new-world" point of view, and, finally, (3) The use of the atomic bomb as well as unrestricted warfare upon enemy civilians. To quote Mr. Baldwin on the latter mistake:

"During the last conflict we brought new horror to the meaning of war; the ruins of Germany and Japan, the flame-scarred tissues of the war-wounded attest our efficiency. And on August 6, 1945, that blinding flash above Hiroshima wrote a climax to an era of American expediency. On that date we joined the list of those who had introduced new and horrible weapons for the extermination of man; we joined the Germans who had first utilized gas, the Japanese with their biological agents, the Huns and the Mongols who had made destruction a fine art.

"It is my contention that in the eyes of the world the atomic bomb has cost us dearly; we have lost morally—we no longer are the world's moral leader as in the days of the Wilsonian Fourteen Points. It is my contention that the unlimited destruction caused by our unlimited methods of waging war has caused us heavy economic losses in the forms of American tax subsidies to Germany and Japan. It is my contention that unrestricted warfare and unlimited aims cost us politically the winning of the peace.

> *"But it is not only—and perhaps not chiefly—in public opinion or in the public pocketbook or even in public stability that we have suffered, but in our own souls. The American public is tending to accept the nefarious doctrine that the ends justify the means—the doctrine of exigency. . .*

"The use of the atomic bomb, therefore, cost us dearly; we are now branded with the mark of the beast. Its use may have hastened victory—though by very little—but it has cost us in peace the preeminent moral position we once occupied. Japan's economic troubles are in some degree the result of unnecessary devastation. We have embarked upon Total War with a vengeance; we have done our best to make it far more total. If we do not soon reverse this trend, if we do not cast about for means to limit and control war, if we do not abandon the doctrine of expediency, of unconditional surrender, of total victory, we shall someday ourselves become the victims of our own theories and practices."

Here is a very important point to keep in mind: It is the distinction between the use and abuse of a weapon. There is always a legitimate use, just as there is always an illegitimate abuse. Shallow thinking frequently loses sight of that distinction so that the arms maker, more often than not, is erroneously described as the cause of war. So it may be again if the American people swing back to blind pacifism. Then the zealots will again blame the

man who made the weapons for their continued use. It would be well to hammer the point home on every occasion. For as Mr. Baldwin so forcefully proves in "Great Mistakes of the War": "We fight to win only; we pay little or no heed to the victory of the peace."

Mobilization Plan

Bernard M. Baruch set down a 9-point program of economic mobilization before a group of students at Columbia University recently. The group is pursuing a course in economic mobilization planning at Columbia's Graduate School of Business. Here is the program of the Chairman of the War Industries Board of World War I who continues to be a sound counselor on industrial preparedness.

Stand-by measures as part of an over-all economic mobilization plan must include:

1. An impartial selective-service law, with a work-or-fight clause.
2. A ready civilian defense.
3. The elimination of profiteering.
4. An over-all ceiling on all prices, rents, wages, and other costs to prevent the inflation that could wreck any mobilization.
5. Higher taxes.
6. Power to curtail less essential production to give priority to military and essential civilian needs.
7. Organization of man power to direct it where most needed, with an index of all essential skills and training facilities.
8. Rationing of scarce essentials.
9. A comprehensive system of economic defense controlling all imports and exports.

Munitions Board Reorganization

Reorganization of the Munitions Board to provide closer grouping of offices having related functions has been put into effect by Hubert E. Howard, Chairman of the Board. The new plan, which was developed in cooperation with the Department of Defense Management Committee, is designed to meet special needs of the Board and to provide it with a more effective working line-up.

The main effect of the reorganization plan is to regroup all functions having primarily industrial aspects under a director of production management and all functions concerned with procurement and distribution under a director of supply management.

Maj. Gen. A. R. Quanton, Jr., formerly acting director of industrial programs, becomes acting director of production management, with the discontinuance of the former title. The plan calls for eventually filling the permanent post of director with a civilian of wide industrial experience. The acting director then would become military adviser so as to provide a balance between civilian and military experience in the industrial programs of the Board.

Under the new Production Management Directorate will come the Offices of Production Planning, Materials Resources, Construction, and Man Power. In addition, the former permanent secretariates of the Munitions Board Committees on Aircraft, Petroleum, and Electronics are given status as divisions and placed under the director of production management.

The post of director for military supply is abolished, and Rear Adm. Morton L. Ring, who has been director, changes over to director of supply management, with his present additional duty as deputy director of the staff. In the new post he will continue to supervise offices concerned with procurement and distribution. These include the Office of Procurement Methods; the Office of Distribution Methods; and the Standards, Materials Inspection, and Cataloging Agencies.

PRICE OF SURVIVAL

W. Stuart Symington hit the nail on the head a few weeks ago, just before he relinquished his post as Secretary of the Air Force to become Chairman of the powerful but long-dormant National Security Resources Board. In an address at Macon, Ga., in which he stressed the fact that "the price of survival is military preparedness" he enjoined all citizens to "work together unceasingly to solve the problem of financing the bare necessities of military security, both at home and abroad, without wrecking our national economy in the process. . . We must not repeat our past error of trying to build as much as possible of everything that might conceivably be useful in any future war. We must concentrate instead on the real necessities, because that production in itself will heavily burden our national economy and resources."

Air Force Strength

The following clarifying statement on the actual strength of the United States Air Force is contained in the semiannual report of the Secretary of Defense, Hon. Louis Johnson.

"In the case of the Air Force, it is worth noting that on January 1, 1948, the Finletter Commission recommended 70 groups manned by 401,000 men. On that date the report also noted that the Air Force stood at 337,000 men for 55 programmed groups. However, due to requirements for the radar screen, increased functions taken over from the Army, and organizational changes in our bomber groups, 502,000 men would be needed today for the 70-group concept or its equivalent. The requirement for an authorized strength of 502,000 men was recognized by Congress in the Selective Service Act of 1948.

"These organizational changes bring up a point which is worthy of comment, namely, the fact that the size of a 'group' is subject to change. As the President has pointed out, 'The number of groups is a somewhat misleading measure of air power since the character, size, number of aircraft, and other elements of the groups are not fixed but constantly changed as conditions require.'

"An example of the type of change to which the President referred is the programmed size of each B-36 heavy bombardment group—which stood at eighteen planes per group less than a year ago, and which stands at thirty planes per group today. . . .

"In our Air Force of today and as planned for 1951 we have 416,000 men manning 48 groups, but, due to organizational changes, these 48 groups, according to Air Force estimates, are equivalent to 52½ groups of the size envisaged in the previous concept of the 70-group program."

On the Industry-Ordnance Team

Brig. Gen. E. L. Cummings

G. C. Brainard

Rear Adm. B. H. Hanlon

E. V. Huggins

Capt. W. B. Moore

Brig. Gen. Emerson L. Cummings, Washington, D. C., of the Research and Development Group, General Staff of the Army, has long been associated with Ordnance progress. His service overseas as Deputy Theater Ordnance Officer in Germany during the Second World War has won for him high commendation.

George C. Brainard, Cleveland, Ohio, is chief of the Cleveland Ordnance District and president of the Addressograph-Multigraph Corporation. He is chairman of the board of the Federal Reserve Bank of Cleveland. During the Second World War he was director of the Tools Division, War Production Board, and deputy director of production.

Rear Adm. Byron H. Hanlon, White Oak, Md., is commander of the U. S. Naval Laboratory. He was graduated from the U. S. Naval Academy, commanded the U.S.S. North Carolina, and has had duty at the Naval Gun Factory in Washington and at the Naval Powder Factory, Indian Head, Md.

E. V. Huggins, New York, N. Y., is secretary of the Westinghouse Electric Corporation. He is chairman of the Inter-Association Group on Government Procurement which includes the American Ordnance Association. A graduate of Yale University, he heads the Westinghouse Corporation's law department in New York.

Capt. William B. Moore, U.S.N., Washington, D. C., is in charge of the Ammunition Branch, Material Division, Bureau of Ordnance of the Navy. He has long been identified with naval ordnance and gunnery.

John E. Goble, Pittsburgh, Pa., is president of the National Tube Company. Formerly an official of the Oil Well Supply Company, he joined the National Tube Company in 1936 as vice-president, and ten years later he was elected president of the company.

Harvey B. Jordan, Cleveland, Ohio, is president of the American Steel & Wire Company. He has been associated with the steel industry for thirty-six years, having started with the Central Furnaces and Docks Company in 1914. He was recently elected a director of the Cleveland Post of the American Ordnance Association.

R. L. Telford, Shreveport, La., is first vice-president of the Silas Mason Company. He has been continuously engaged in engineering and production work for the Ordnance Department of the Army since 1940. He is vice-president of the Association's new Louisiana Post.

R. M. Kant, Lancaster, Pa., is president of the Hamilton Watch Company with which he has been associated for thirty-four years. During the Second World War he supervised operations of his company with various defense bureaus and agencies in the production of varied types of precision timing instruments.

Capt. Delmer S. Fahrney, U.S.N., Point Mugu, Calif., is in charge of the Naval Air Missile Test Center there. Formerly he was director of the Pilotless Aircraft Division of the Navy's Bureau of Aeronautics. Long identified with naval aviation, he formerly commanded the Naval Aircraft Modification Center.

J. E. Goble

H. B. Jordan

R. L. Telford

R. M. Kant

Capt. D. S. Fahrney

ASSOCIATION AFFAIRS

• **THE CONSTITUTION AND BY-LAWS** of the American Ordnance Association are being studied meticulously these days to make certain that they are adequate to meet all demands facing a leading national society of individuals for maximum service to the national defense. A General Committee on Aims and Organization authorized at the last meeting of the Board of Directors now has the study under way. The committee consists of: Herbert A. Gidney, executive vice-president, Gulf Oil Corporation, Pittsburgh, Pa., *chairman*; Harvey C. Knowles, vice-president, Procter & Gamble Company, Cincinnati, Ohio, *vice-chairman*; Robert L. Biggers, president, Fargo Division, Chrysler Corporation, Detroit, Mich., *vice-chairman*; Louis Polk, president, Sheffield Corporation, Dayton, Ohio, *vice-chairman*; Brig. Gen. Donald Armstrong, president, U. S. Pipe and Foundry Company, Burlington, N. J.; Lieut. Gen. Levin H. Campbell, Jr., executive vice president, International Harvester Company, Chicago, Ill.; Col. Irving A. Duffy, vice-president, Ford Motor Company, Detroit, Mich.; E. E. Gillmor, Sperry Corporation, New York, N. Y.; E. R. Godfrey, vice president, General Motors Corporation, Detroit, Mich.; E. T. Gushée, vice-president, Detroit Edison Company, Detroit, Mich.; Stanley C. Hope, president, Esso Standard Oil Company, New York, N. Y.; Vice Adm. George F. Hussey, Jr. (Ret.), managing director, American Standards Association, New York, N. Y.; C. Jared Ingersoll, director, Pennsylvania Railroad, Philadelphia, Pa.; Col. D. J. Martin, vice-president, Hughes Tool Company, Houston, Tex.; Col. John S. Pfeil, vice president, Stone & Webster Engineering Corporation, Boston, Mass.; Col. William I. Rushton, Protective Life Insurance Company, Birmingham, Ala.; John Sliwak, president, Turner Brass Company, Sycamore, Ill.; J. D. Spalding, National Supply Company, Torrance, Calif.; Col. Dean Witter, San Francisco, Calif.

The following are *ex officio* members of the committee: James L. Walsh, president, American Ordnance Association, Washington, D. C.; Leo A. Codd, A.O.A. executive vice president, Washington, D. C., *secretary*; Burton O. Lewis, A.O.A. staff consultant, Washington, D. C., *assistant secretary*.

To facilitate the work of the general committee, a review committee, after several meetings at the University Club, New York, has prepared a draft of proposed changes in the constitution and by-laws. The draft is now in the hands of members of the general committee for recommendations. The review committee consists of Messrs. Gidney, Knowles, Biggers, Polk, Armstrong, Godfrey, Hussey, Walsh, Codd, and Lewis.

James L. Walsh, president of the Association and a charter national director, was the speaker at a joint luncheon of the American Society of Mechanical Engineers and the St. Louis Post, A.O.A., at the Hotel Statler, St. Louis, Thursday, June 22nd. The luncheon-meeting was a feature of the 1950 semiannual meeting of A.S.M.E.

"Working for Peace" was the topic which Colonel Walsh presented with forceful emphasis upon the essential character of ordnance preparedness. He has been closely identified with the A.S.M.E., especially in its war production activities during the Second World War. This, together with his intimate knowledge of ordnance and his long service as a member of the Ordnance fraternity, gave his message on especially timely and authentic character.

Toastmaster at the luncheon was James S. Bush, chief of the St. Louis Ordnance District and vice-president of the Industrial Bank. Col. Edwin B. Meissner, Post president, headed a large delegation of Post members who were present to hear Colonel Walsh.

• **AT NEW ORLEANS**—The Officers' Club of Camp Leroy Johnson was the scene, May 25th, of the presentation of the charter to the Louisiana Post. This latest addition to the American Ordnance Association's growing family of local Posts was established at the Industry-Army Conference in New Orleans earlier in the year.

More than 150 members of the new Post and their guests attended the dinner, at which Leo A. Codd, executive vice-president of the Association, presented the charter and delivered the principal address.

Among the invited guests were: Brig. Gen. John Weckerling, chief, Louisiana Military District; Brig. Gen. Raymond F. Hufft, Adjutant General of Louisiana; Col. A. D. Higgins, commanding officer, New Orleans Port of Embarkation; Col. A. H. Schroeder, commanding officer, Camp Leroy Johnson. The Hon. DeLesseps S. Morrison, Mayor of New Orleans, was represented by James Fitzmorris, who organized the Industry-Army Conference in New Orleans last February.

Officers and directors of the new Post are: President, N. L. Hawkins, New Orleans Equipment Company; Vice-president, R. L. Telford, Silas Mason Company, Shreveport; Secretary-treasurer, Maj. E. P. Gizzi, Ord. Dept., U. S. Army, New Orleans Port of Embarkation.

The Post directors are: R. A. Cuyler, Louisiana Power & Light Company, New Orleans; W. C. Nabors, W. C. Nabors Company, Mansfield; E. A. Merklein, Merklein and Company, Shreveport; J. Edgar Monroe, Boland Machine & Manufacturing Company, New Orleans; A. J. Higgins, Higgins, Inc., New Orleans; and J. M. Guillory, New Orleans Public Service, Inc.

• **AT BOSTON**—The Yankee Post spring meeting—"Ashore and Afloat"—was highlighted by a visit to the Boston Naval Shipyard at Charlestown, Mass. on May 24th. Capt. R. Morgan Watt, Jr., U.S.N., shipyard commandant, welcomed the members of the Post, led by their president, Col. L. J. Meyns. The reception was held at the Officers' Club of the shipyard.

After a description of the ships to be viewed, the visitors were conducted on an inspection tour of the ropewalk, forge shop, machine shop, dry dock, and the waterfront activities of the establishment.

Members were privileged to inspect the frigate U.S.S. *Constitution*, pride of the Navy since 1797, and the oldest U. S. naval vessel in commission. Taken down the bay to the South Boston Annex of the Naval Shipyard, they viewed the thirty-two ships of the Boston Group of the Atlantic Reserve Fleet and inspected the world's largest dry dock.

Returning to the shipyard by the main ship channel, a buffet dinner was served in the Officers' Mess.

The program committee which arranged this historic meeting consisted of: W. B. Loomis, *chairman*; I. J. Fain, R. M. Fellows, J. W. Graham, T. F. Halloran, H. D. LeBlanc, and J. G. Redmon.

• **AT QUANTICO, VA.**—In tribute to "Armed Forces Week" (May 15th-20th) a representative group of members of the Washington Post, led by the Post's Secretary-Treasurer, J. Donald Browne, on May 18th embarked on an all-day tour which included the U. S. Marine Base and the famed F.B.I. Police Academy. The morning was devoted to demonstrations of F.B.I. training courses in the handling of all weapons and practical field work and investigations followed by an inspection tour through the academy's quarters.

After lunch with the F.B.I., the Marines took over. The artillery and small-arms schools demonstrated their matériel and their work. The A.O.A. group next witnessed the practice match firing of the assembled Marine Corps crack rifle and pistol shots on the extensive Quantico ranges, some members of the A.O.A. participating in the pistol practice firing. A tour of the base area wound up the day's trip.

• **AT LAKE SUCCESS**—The Industrial Mobilization Committee of the New York Post, A.O.A., under the chairmanship of Maj. Gen. R. L. Maxwell, vice-president, American Machine & Foundry Company, visited the Sperry Gyroscope Company plant at Great Neck, New York, May 12, 1950, in connection with the industrial-preparedness program of the Post. The group inspected the facilities of the Sperry establishment and heard a most interesting analysis by F. S. Hodgman, a staff member of the Sperry Company, on postwar industrial mobilization planning by that organization.

Mr. Hodgman's analysis called attention to some of the obstacles in our current mobilization planning, citing various technicalities under the present governmental procedures. In concluding his remarks, however, he said: "It has not been our intention in this recital to strike a discouraging note by citing only the shortcomings of industrial mobilization planning. Rather it is hoped that we may more quickly arrive at the desired objective by concentrating on such shortcomings and endeavoring to improve or eliminate them."

This visit to the Sperry plant by General Maxwell's committee is a continuation of a policy begun some months ago, under which the committee, in carrying forward its industrial-mobilization studies, visits special plants in the New York area. Earlier in the year a similar visit was made to the United Pipe and Foundry Company plant at Burlington, N. J., of which Brig. Gen. Donald Armstrong, former commandant of the Industrial College of the Armed Forces, is president, and Col. S. B. Ritchie, well-known former Army Ordnance officer, is a director of research.

The above photograph was taken during the visit of the Industrial Mobilization Committee of the New York Post to the Sperry Gyroscope plant at Great Neck, N.Y. In the front row are (left to right): P. B. Bassett, Maj. Gen. R. L. Maxwell, Maj. C. Stewart Comeaux, Maj. Gen. Follett Bradley, Maj. Gen. W. I. Westervelt, Frederick Tomkins, R. E. Gillmor, Col. F. I. Ordway, Jr. Second row (left to right): Vice Adm. G. F. Hussey, R. B. Lea, C. P. Ray, Col. L. W. Stearns, J. D. Neely, P. T. Cullen, V. J. Zaro. Top row (left to right): E. F. Lazar, James Mattern, G. R. Lawrence, Lieut. Col. C. K. Allen, F. S. Hodgman, A. L. Williams.

• **AT CLEVELAND**—The board of directors of the Cleveland Post, meeting at the Union Club on May 8th, announced the election of William A. Weaver as Post president and of Harvey B. Jordan, president, American Steel & Wire Company, as a director.

Colonel Weaver is assistant to the president of the Griswold-Eshleman Company, Cleveland. He succeeds Ward M. Canaday, chairman of the board of Willys-Overland Motors, Inc., Toledo, as leader of this important local Post.

Col. W. A. Weaver
Newly elected president of the Cleveland Post, A.O.A.

Mr. Jordan will serve on the board of directors of the Cleveland Post in place of Clifford F. Hood, former president of American Steel & Wire and a founder of the Cleveland Post. Mr. Hood has moved to Pittsburgh where he is president of the Carnegie-Illinois Steel Corporation and a director of the Pittsburgh Post, A.O.A. Mr. Jordan has been in the steel industry since 1914, starting with Central Furnaces and Docks Co.

President Weaver and his board will embark shortly on a program of Post activities throughout the Cleveland area. Other officers and directors of the Post, in addition to Mr. Weaver and Mr. Jordan, are: J. C. McHarman, vice-president; R. F. Black, George C. Brainard, F. H. Chapin, F. C. Crawford, D. S. Ellis, William Forster, B. F. Hopkins, A. D. Joyce, Frank Purnell, H. A. Roemer, W. R. Timken, J. E. Trainer, A. J. Weatherhead, Jr., C. M. White, and Clyde Williams, directors. The secretary-treasurer will be appointed in the near future.

• **AT BALTIMORE**—Dr. C. F. Pickett, president of the Aberdeen Proving Ground Post, led 75 members of the Post in a day-long trip to the plant of the Crown Cork & Seal Company, on May 10, 1950.

Under the supervision of William P. Meeker, a corps of company officials conducted small parties through the entire plant which did so much to produce anti-aircraft matériel in both World Wars.

The cap and seal division of the plant was visited in the morning. After luncheon as guests of the company, F. S. Bell of the engineering staff explained the work of the company's machinery division. The tour of the large tool-making and machine shops followed. At its conclusion, leaders of the Aberdeen Post and visitors from the headquarters staff of A.O.A. thanked John J. Nagle, Crown Cork & Seal Company president, who expressed his hope of a quick return visit by the group.

• **AT LOS ANGELES**—J. D. Spalding, Post president, led one hundred enthusiastic members of the Los Angeles Post,

on May 4th, on an all-day field trip to two near-by establishments, one naval and one industrial, of significance to the scientific progress of the national defense.

At Azusa, Calif., the visitors were received by T. E. Beehan, secretary-treasurer of the Aerojet Engineering Corporation, and conducted through the plant which is engaged in developing and producing jet-propulsion mechanisms, including JATO (jet-assisted take-off) and underwater motors.

At Pasadena, Calif., they were welcomed by Comdr. William Hasler, U.S.N., officer in charge of the U.S. Naval Ordnance Test Station. The latest developments in the field of underwater missiles were displayed at the famous Morris Dam Test Range. The combined trip did much to promote the awareness of members of the Post of two vital ordnance developments of modern defense.

On May 17th the Los Angeles Post joined with the Los Angeles Chamber of Commerce and the Military Order of the World Wars in a luncheon meeting to mark the celebration of Armed Forces Day. Gen. Clifton E. Cates, Commandant of the United States Marine Corps, was the guest of honor and the speaker at the joint celebration.

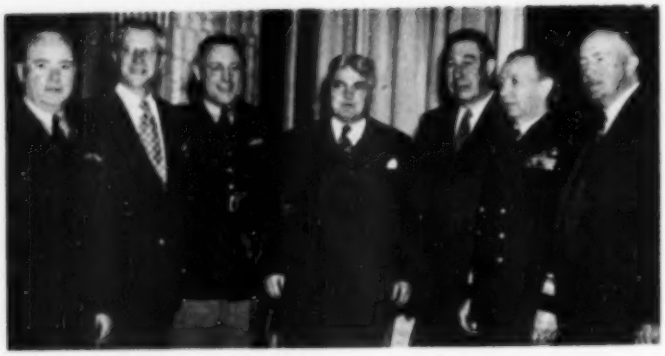
• **AT SYRACUSE**—On May 2nd, the Syracuse-Central New York Chapter played host to its parent organization, the Empire Post. A dinner meeting was held in the grand ballroom of Hotel Syracuse and was presided over by Keith Williams, vice-president of the Post. Mr. Williams, president of Pratt & Letchworth Company of Buffalo, took the place of Post president E. A. Hallfield, Rochester, who was unavoidably absent.

Toastmaster of the evening was Philip P. Glassey, vice-president of Easy Washing Machine Company and chairman of the Central New York Chapter of the Empire Post. Greetings were tendered the Ordnance fraternity by Hon. Thomas J. Corcoran, Mayor of Syracuse. Col. Morell K. Brewster, U.S.A.F.R., commanding the 9061st Volunteer Air Reserve Training Group; Col. Harry H. Haas, deputy chief, Rochester Ordnance District, and James L. Walsh, president of the American Ordnance Association.

The principal speaker and honor guest of the occasion was the distinguished Chief of the Bureau of Ordnance of the Navy, Rear Adm. Albert G. Noble, who spoke of the work of the naval Ordnance establishment in relation to American industry and praised the cooperation of the member committees and Posts of the American Ordnance Association.

The newly elected officers of the Syracuse-Central New York Chapter, in addition to Chairman Glassey, are: Vice-Chairmen John D. Williams, Lipe Rollway Corporation, Syracuse; Ray C. Malvin, Fitzgibbons Boiler Company, Oswego; Charles D. Osborne, *Citizen-Advertiser*, Auburn; Richard W. Noyes, Oneida Limited, Oneida; Mark Russell, Pass & Seymour, Inc., Syracuse; George R. Auld, Carrier Corporation, Syracuse; Robert I. Hicks, Lamson Corporation, Syracuse; and H. A. Schultze, New Process Gear Corporation, Syracuse; Meeting Chairman, John I. Dean, Porter-Cable Machine Company, Syracuse; Membership Chairman Stanley H. Ellison, Carrier Corporation, Syracuse; and Secretary Gwyn Thomas, Manufacturers' Association, Syracuse.

The following officers and directors of the Empire Post were also elected: President, E. A. Hallfield; First vice-president, Keith Williams; Second vice-president, C. E. Norquist; Directors: The officers and C. F. Dietz, E. E. Dillon, Mark Ellingson, J. E. Gleason, C. S. Hallauer, M. J. Hayes, F. F. Hickey, T. L. Lee, R. H. Pass, H. B. Sheets; Treasurer, E. E. Davenport; Secretary, R. C. Hands.



Shown above at the annual dinner-meeting of the Empire Post in Syracuse are (left to right) Col. M. K. Brewster, Philip P. Glassey, Col. H. H. Haas, Mayor T. J. Corcoran, Keith Williams, Rear Adm. A. G. Noble, and James L. Walsh.

• **AT DENVER**—Under the leadership of James D. Maitland, president, Cobusco Products Company and president of the Post, a large contingent of members of the Rocky Mountain Post assembled April 26th to honor Col. Benjamin S. Mesick, who addressed the Post on the function and future of rockets. His address was most timely, being devoted to a subject with which Colonel Mesick has had important service.

Mr. Maitland, in introducing the speaker, referred to his part in forming the Lehigh-Bethlehem Post of the A.O.A. When in charge of the Ordnance Unit, R.O.T.C., at Lehigh, Colonel Mesick organized the Post in November 15, 1939. Later he served on the Technical Staff of the Ordnance Department and subsequently served in General Patton's Third Army in the Second World War.

Other officers and directors of the Rocky Mountain Post who assisted Mr. Maitland in arranging the meeting were: James Colasanti, *vice-president*; A. W. Ainsworth, J. L. Brown, C. C. Drake, F. R. Eberhardt, B. C. Essign, J. K. Garretson, J. G. Gates, R. P. Gutshall, M. M. Millsap, N. H. Orr, G. A. Sabin, S. C. Shubert, H. F. Silver, T. C. Timpte, J. R. Travis, C. W. Webb, and A. D. Weiss, *directors*; W. E. Lipsey, *secretary-treasurer*.

• **AT HOUSTON**—The annual meeting of the Texas Post was held April 20, 1950, at Ellington Air Force Base. Col. William L. Lee, base commander, opened the entire field for inspection to members of the Post. Tour of the field began at 4 p.m. and was conducted by military personnel who explained various points of interest.

At this meeting the Post entertained sixteen student and faculty members of the Industrial College of the Armed Forces who were having their annual visit to military and industrial establishments in the Southwest. At the dinner-meeting following the tour an address of welcome was given by Herman Brien, president of the Post, who introduced Colonel Lee. Others speakers included representatives of the Industrial College: Dr. M. S. Reichley, who spoke on the history of the college, and Col. H. R. McKenzie, the title of whose address was, "The Most Significant Developments in the Field of Industrial Mobilization as of Today."

Lieut. Col. J. C. Childs, deputy chief of the St. Louis Ordnance District, outlined plans for the utilization of various Texas plants for ordnance production, many of which have already received the base drawings and agreed on the rate of production for the first two years of a war emergency.

At the election of officers held during

the meeting Col. D. J. Martin, director of research, Hughes Tool Company, was elected president of the Post. He is well known throughout the Ordnance fraternity for his great contribution toward the success of the artillery production program during the Second World War when he served first as an assistant to the head of the artillery program, Brig. Gen. Gordon M. Wells, and later as an assistant to the Chief of Ordnance of the Army, Lieut. Gen. L. H. Campbell, Jr.

Other new officers of the Post in addition to Colonel Martin are: Vice-president, E. D. Konken, Napko Paint & Varnish Company; Secretary-treasurer, L. S. Bassett, Dickson Gun Plant; Directors: S. P. Farish, Reed Roller Bit Company; F. M. Wittlinger, Texas Electric Steel Casting; L. B. Ryon, The Rice Institute; W. O. Hedrick, McEvoy Company; W. H. Miner, Lufkin Foundry and Machine Company; and H. H. Brien, Texas Foundries, Inc.

National officials include: B. T. McNeil, McEvoy Company, member of the National Advisory Board; and Ross Stewart, C. Jim Stewart and Stevenson, member of Council.

• **AT CHICAGO**—With Gen. Jacob L. Devers, great European tactician of American Forces during the Second World War, as the principal speaker and Lieut. Gen. Levin H. Campbell, Jr., retooled Chief of Ordnance of the Army during that conflict, as guest of honor, the 1950 Regional Meeting of the Association was held in Chicago under the auspices of the Chicago Post, April 12, 1950. General Devers described with unusual brilliance the performance of ordnance equipment throughout the last war and paid tribute to the Industry-Ordnance Team for its mammoth share in victory.

John Slezak, wartime chief of the Chicago Ordnance District and president of the Chicago Post, presided at the dinner-meeting at which James L. Walsh, president of the Association served as toastmaster. More than 800 members and guests of the Chicago Post and of Posts adjacent to Chicago were in attendance.

Preceding the dinner-meeting a technical session in the afternoon was presided over by H. J. Prebensen, Post vice-president. Technical papers were presented by Col. Edward P. Mechling, assistant Armament Officer, U. S. Air Force, and by Capt. A. D. Blackledge, commanding officer of the Naval Ordnance Plant at Indianapolis, Ind.

A high light of this Regional Meeting was the presentation of student memberships by the Chicago Post to the three groups of young men representing Illinois Institute of Technology, University of Illinois, and Northwestern University—The Technological Institute. The Chicago Post, under the guidance of Col. William R. Wright, has led the country in the sponsorship of student activities at schools and colleges within its area. Each year the Post awards membership in the Association to twenty-honor students at each institution. Selections are made by student counselors at the respective colleges.

Under the general chairmanship of William C. Swartchild, Jr., the following served as chairmen of their respective committees: Keith I. Parsons, Program; M. J. Allen and J. W. Karraker, Arrangements; Mr. Prebensen, Reception; J. Albert Roesch, Promotion; and G. D. Dearlove, Budget.

• **AT HARTFORD**—The annual dinner-meeting of the Hartford-Springfield Post was held at the Hotel Bond on April 11th. Members and guests to the number of 225 attended. The Chief of Ordnance of the Army, Maj. Gen. E. L. Ford, told the group of plans on the part of the Ordnance Department for developing and maintaining powerful and effective ordnance matériel.

A feature of the meeting was the recognition of the work done through the years by Col. Frederick H. Payne, chairman of the board of directors of the Post and a director of the national Association, in supporting and furthering the aims and ideals of the A.O.A.

Stanley C. Hope, president of the Post, who presided at the meeting, presented Colonel Payne with a portfolio of letters from friends in civilian and military life who have long been associated with him. Among the many letters were testimonials from such well-known persons as former President Herbert W. Hoover and General of the Army Dwight D. Eisenhower.

Leo A. Codd, executive vice-president of the Association, gave well-merited praise to Colonel Payne for his helpful work in supporting the organization and developing its plans since its foundation in 1919. In those early days Colonel Payne served with distinction as the Assistant Secretary of War in the Cabinet of President Hoover when Major Eisenhower was at work under Gen. Douglas MacArthur on an industrial mobilization plan.

Colonel Codd told how the foresight of the then relatively small group in developing and fostering industrial preparedness was not recognized nor was it very popular with the general public. Colonel Payne gave his unstinted support and valuable aid to the organization at a time when its philosophy was politically unpopular.

In the course of the meeting, Col. Morris K. Barroll, Jr., retiring commanding officer of Springfield Armory, was presented with a deep-sea fishing rod and reel in recognition of his outstanding service to the Hartford-Springfield Post.

Colonel Barroll will be succeeded at Springfield by Col. J. L. Gunn, well-known member of the A.O.A. and an outstanding ordnance engineer. General arrangements for the meeting were in the capable hands of J. Alan MacDonnell of Gilbert & Barker Manufacturing Company who is secretary of the Post.

• **AT KARLSFELD, BAVARIA**—A group of Army Ordnance personnel under the inspiration of Lieut. Col. Robert E. L. Masters is giving consideration to the formation there of an Ordnance group as a unit of the American Ordnance Association. Colonel Masters is commanding officer of the Karlsfeld Ordnance Depot. Lieut. Col. L. S. Devore, division Ordnance Officer, 1st Infantry Division, is also actively interested in the project.

While it may not be possible to meet the formal requirements for the organization of a local Post of the Association, there is every indication that the thirty-five members of the A.O.A. who are presently located within the area may unite to form a chapter or group devoted

Among those attending the Industrial Mobilization meeting of the Philadelphia Post at the Hamilton Watch Company plant in Lancaster, Pa., in April were (left to right): Rear Adm. J. A. Snackenberg, Maj. Gen. E. L. Ford, R. M. Kent, G. P. Luckey, Maj. Gen. G. M. Barnes, and Maj. Gen. R. C. Coupland.

to the advancement of ordnance technology, particularly in the field of logistics, with special emphasis on problems connected with packaging and warehousing of equipment.

• **AT CAMBRIDGE**—The student Post of the American Ordnance Association at Massachusetts Institute of Technology has been holding regular meetings. Many interesting programs have been developed. In April, Joseph Sullivan, technical adviser to the director of the Watertown Arsenal Laboratory, addressed members of the Post on the technical aspects of various projects under way at Watertown Arsenal. Later the same month the Post sponsored a tour by its members to Watertown.

Much of the success of the M.I.T. Post has been due to the interest and industry of Lieut. Col. R. S. Crossman, Ordnance Department, U. S. Army, who is about to complete his four of duty of four years at M.I.T. When assigned there he reorganized and revitalized the M.I.T. Post which quickly resumed its outstanding program of ordnance activity begun when the group was founded in 1922.

The student members of the Post were inspired by Colonel Crossman's leadership. They responded by an unusually active program of exceptional educational value. Colonel Crossman is scheduled for assignment to the Military Aid Advisory Group to Denmark, and will embark for this post during the summer. His students and all other members of the A.O.A. join in best wishes to him.

• **COL. JAMES E. McNARY**, a charter member of the American Ordnance Association and for many years an officer of the New York Post, died at his home in New York City on May 11, 1950. He was one of the best-known officers of the Ordnance Reserve Corps, with which he had been identified for more than thirty years. He was a consulting engineer on the staff of Esso Standard Oil Company.

Born in Pennsylvania, Colonel McNary began his military career in 1899 as an enlisted man in the 10th Pennsylvania Infantry. He served in the Spanish-American War and in the First World War. In the Second World War he was a consultant to the Quartermaster General of the Army and the Secretary of War. His services were related especially to the supply of fuels and lubricants. His efforts in the development of transmission pipelines were especially noteworthy.

While many instances could be cited of Colonel McNary's energetic participation in preparedness measures throughout the years, two in particular were acclaim for him. Many years prior to the Second World War he became interested in the problem of toluol supply as the basis of wartime high-explosive needs. In cooperation with Col. C. G. Mettler, New York Ordnance District, he outlined a program for toluol recovery which resulted in the huge toluol plant of the Humble Oil Company, Baytown, Tex. This plant alone supplied a vast portion of the toluol needed for the TNT program and supplanted gas-stripping plants attached to hundreds of municipal gas works throughout the First World War.

Colonel McNary's foresight and good judgment had much to do with this vital development. He described some of his experiences in this field in an article in this magazine, "Synthetic Toluene" (Vol. XXVI, No. 138, September-October, 1946, page 144). Long identified with Reserve officer affairs, Colonel McNary rendered yeoman service to the Reserve Officers' Association of the U. S. for many years. With the coming of the Second World War, Colonel McNary was appointed one of the trustees of the R.O.A. to guard its interests and funds until the organization would be reestablished following that conflict. He gave imparingly of his time and energy to this duty, enabling the R.O.A. to start anew with its funds intact.

Jim McNary was especially well known throughout the New York Ordnance District in the operation of which he took an important part for many years. Likewise, the New York Post of the Ordnance Association had the benefit of his energetic help at all times. He served as a vice-president of the Post for many years. Although in failing health at the time of the Association's dinner meeting in tribute to Secretary of Defense Louis Johnson in September 1949, Colonel McNary was present there in his accustomed place.

The national defense of the United States has lost an outstanding member of its civilian component, for Jim McNary to a most unusual degree translated his patriotic zeal with unfailing loyalty and energy for the security of his native land. The Ordnance fraternity, too, has lost a stalwart leader.—L.A.C.

Five pages of this issue of ORDNANCE are devoted to Association Affairs. As will be seen from the text, the Association is especially active in its work from coast to coast for scientific and industrial preparedness. In addition to the meetings and conferences here described, members are reminded that each month they receive their individual copies of THE COMMON DEFENSE—the Association's Washington newsletter in which activities of A.O.A. Posts are also reported upon, and INDUSTRIAL PREPAREDNESS—our monthly report to members on the programs, meetings, and schedules of the Association's 42 Technical Divisions and Committees. These publications, as is also the case with ORDNANCE magazine, are sent to all members of the Association without extra cost.—THE EDITORS.

• **MAJ. ANTHONY FIALA**, author, explorer, former officer of the Ordnance Department of the Army, and a charter member of the American Ordnance Association, died at his home in New York on April 8, 1950. Veteran of a Brazilian and two polar expeditions and with service in the Spanish-American and First World Wars, Major Fiala served in the Ordnance Department of the Army at the Springfield Armory following a period as captain of a machine-gun troop on the Mexican Border. He was recognized as an expert with the pistol and rifle. Major Fiala is said to have built in New York the first standard-size commercial shooting range.

As an explorer, Major Fiala participated in two expeditions to the North Pole in 1901 and 1903. In 1914, he accompanied Theodore Roosevelt on the latter's exploration of the "River of Doubt" in Brazil. This expedition traversed 900 miles of primeval jungle, charting the stream as a tributary of the Amazon.

At funeral services held at Christ Church, Bay Ridge, the American Ordnance Association was represented by Colonel Crosby Field, long-time friend of Major Fiala.

• **COL. JOHN J. DOOLEY**, expert on military rifles and machine guns and a charter member of the A.O.A., died at Larchmont, N. Y., March 30, 1950, in his eightieth year. Long identified with the U. S. Marine Corps, in which he held a Reserve commission, he was until the time of his retirement an official of the National Lead Company with headquarters in New York City.

Colonel Dooley, a native of Maine, served in the National Guard of that State, becoming a champion rifle shot. During the First World War he organized a school for the instruction of machine-gun operators at Utica, N. Y., where U. S. Marines were taught the characteristics and operations of the machine gun. Some 7,000 graduates, experts in machine gunnery, were the products of the school. Colonel Dooley was for many years an official in the National Rifle Matches at Camp Perry, Ohio.

Following the First World War he entered the employ of the U. S. Cartridge Company and later became a special representative of the National Lead Company.

New DEVELOPMENTS

NEW WEAPONS REVEALED

Gen. J. Lawton Collins, Chief of Staff of the Army, stated recently that the Army has in advanced stages of development new antiaircraft rockets "which we are confident will be able to destroy planes at altitudes above 60,000 feet." He also noted that the range of almost twelve miles expected of the rockets is above the altitude which any known bomber can reach, and he added that the new weapon will be relatively inexpensive.

"We also have an antiaircraft guided missile which gives promise of destroying attacking planes at even greater ranges and with even greater accuracy," General Collins said.

Another heartening disclosure was that the Army is well on the way toward producing a weapon "of radical design" which may change the whole concept of tank warfare. How to defeat potential aggressor armies equipped with vast numbers of tanks was a problem which plagued the armed forces during the war and has become a greater worry since the end of hostilities, but the new weapon may provide the answer.

SUPERBOMB ELEMENTS

It has been conjectured that the so-called "superbomb" will be based on the reaction of hydrogen and tritium—a reaction made public last year by scientists of the Los Alamos Atomic Energy Commission Laboratory.

Tritium is not found in nature and can be made only in a uranium pile—the type that also produces plutonium necessary for the atomic bomb. Tritium is hydrogen that is three times as heavy as ordinary hydrogen. The reaction between it and hydrogen protons will produce helium and billions of electron-volts of energy. However, to get an efficient reaction a very intense heat would first have to be created. Heat of the desired magnitude is released on the explosion of the present atomic bomb.

It has also been reported that another hydrogen-helium reaction might be used in bomb making; namely, the reaction between deuteron and deuteron. Deuterium is the source of deuterons and is twice as heavy as ordinary hydrogen. Unlike tritium, deuterium is relatively plentiful and can be obtained by removing the oxygen from "heavy water."

NEW TITANIUM ALLOY

A new lightweight, high-strength titanium alloy which retains basic properties at high temperatures and is highly resistant to corrosion has been developed by the Navy Bureau of Aeronautics. Composed basically of five per cent chromium, three per cent aluminum, and the rest titanium, it is being used in jet-plane parts where strength at high temperatures is most important. The Bureau is working closely with industry to facilitate full commercial application.

SUBMARINE DEVELOPMENTS

The Navy is continuing its postwar submarine development program with the construction of two new classes of undersea fighters. One is a new fast attack class of submarines which will have greater submerged speed than present fleet-type submersibles and will carry the latest electronic detection equipment. The other is an antisubmarine class of undersea fighters that will be smaller than any submarines built since the World War I types.

A total of six fast attack submarines and three antisubmarine submarines are being built. The first vessels of each class are expected to be completed in 1951. Submarines of the fast attack, or SS-563, class will be shorter than the current 311-foot fleet type, but will have about the same displacement—1,500 tons. They will have entirely streamlined superstructures, and will be snorkel-equipped. The SSK's—antisubmarine submarines—will be 195 feet long and will displace 750 tons. They will carry advanced sonar and electronic detection equipment.

GUIDED-MISSILE AIRCRAFT

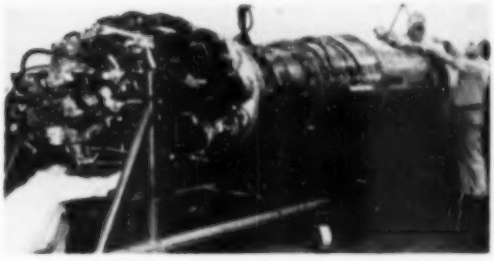
The Air Force has indicated in its semiannual report that progress is being made toward a new intercontinental weapon—a plane that will stay outside an enemy's defenses and send a guided missile hundreds of miles to the target. Such a combination is regarded by the Air Force as one answer to improvements being made in fighter and antiaircraft defenses against bombing planes.

NEW GUIDED MISSILES

Two recent major achievements in the field of guided missiles include a 12,000-pound bomb that can be guided all the way to its target and several self-propelled guided missiles, with ranges in excess of 500 miles, capable of causing as much destruction as 10 unguided bombs of the same explosive power.

NEW TURBO-WASP JET

The Air Force's North American F-93A gets its tremendous speed from the Pratt & Whitney J-48 turbo-wasp engine, claimed to be the most powerful jet engine now flying. With a basic dry rating of 6,250 pounds' static thrust at sea level, the new



The J-48 turbo-wasp—most powerful U.S. jet engine.

engine is equipped with water injection and afterburner, both of which provide substantial power increases over the basic rating for short periods. The engine was developed in this country under the auspices of the U. S. Navy and is also in use in the Grumman Panther, a carrier-based fighter.

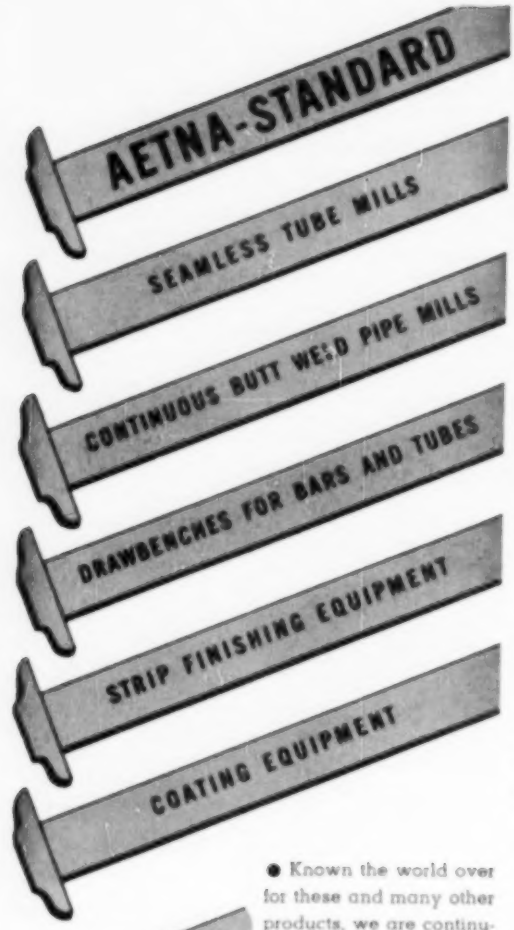
ARMY TO BUY SNIPERSCOPES

The "night eyes" of the rifleman, the electronic "sniperscope" that is credited with causing thirty per cent of all enemy casualties in the Okinawa campaign, is being made a standard item of Army equipment, and units in all the Army's ten divisions will be equipped with the device. Included in the Army's budget requests is an $8,654,418 item for the purchase of 6,918 "sniperscopes" at a cost of $1,251 each. How many of the devices are already in use is considered secret information.

The "sniperscope" consists of an electronic telescope that is mounted on the standard Army caliber .30 carbine. Wiring runs from a portable power pack carried in a knapsack on the soldier's back to an infrared spotlight mounted under the weapon.

NEW 60-KW GENERATOR

A 60-kilowatt generator weighing only 3,300 pounds, about half the weight of standard generators of that capacity, is the latest piece of lightweight equipment developed for the Navy Bureau of Yards and Docks. Its high-speed Diesel engine runs



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at 1,800 revolutions a minute, utilizes lightweight alloys, and is insulated with silicone. Its 60-cycle, 3-phase, 4-wire dual-voltage system is capable of 120/209 or 240/416 volts. The new power unit is 107 inches long, 69 inches high, and 35 inches wide.

AIRPLANE STRUCTURE IMPROVED

Reynolds Metals Company officials and U.S. Air Force matériel specialists have announced the successful completion of an experiment in extruding aluminum alloys which results in airframe sections of integrally stiffened structure. The process is one which makes the outside skin of metal and the internal construction a solid mass united in its entirety. Under tremendous pressure, giant extrusion machines push out big metal pipes much like squeezing toothpaste. T configurations on the outside of the pipe make the added strength of the metal. When cooled, the pipe is split and flattened with the rows of T's a solid part of the sheet. Observers of the new process said it would enable manufacturers eventually to build military aircraft wings and probably fuselages without internal spar bracings.

HIGH-ALTITUDE PHOTOGRAPHY

Photographs from 90,000 to 100,000 feet high will be made in Air Force studies of upper-air photography, using balloons to carry aerial cameras in specially built containers which have their own pressurization, air circulation, and heating. The cameras will be powered by an aircraft battery, and will take pictures every 30 seconds up to 100,000 feet altitude, continuing until the film supply is exhausted. After five hours at this height, the equipment will be dropped from the balloon by parachute.

AIRBORNE SUB KILLER

A new model of the long-range P2V Neptune will be the first aircraft specifically designed to meet the threat of snorkel-type enemy submarines. Its sensitive search radar permits detection of smaller targets, such as a snorkel tube, over a much greater distance than heretofore possible with long-range patrol planes.

To locate submerged submarines accurately, the P2V-4 will utilize magnetic detection gear and sonobuoys. These small radio buoys are dropped in a specific pattern over the area where a submarine is suspected. Floating on the surface the buoy automatically lowers a small hydrophone to the proper depth where the noise of the submarine's propellers is detected by the hydrophone and transmitted. Receivers in the aircraft permit the operators to plot the submarine's position by interpreting the relative noise level transmitted by the sonobuoys. The aircraft's armament will include rockets, cannons, torpedoes, mines, and bombs.

FLYING-WING BOMB

Research scientists of the Australian Division of Aeronautics are perfecting an advanced type of guided missile, the "flying-wing" bomb. The "flying wing," modeled on modern flying-wing aircraft, will have a war head, jet engines, and radio control. The new missile will be tested on the South Australian rocket range.

SYNTHETIC MICA

Synthetic mica, with essentially the same properties as natural mica, but able to withstand much higher temperatures, has now been crystallized successfully at the National Bureau of Standards. Mica could be synthesized by duplicating the conditions under which it is formed in nature, but this would involve extremely high pressures as well as high temperatures. For safety and convenience it is better to work at atmospheric pressure. For that reason the Bureau's scientists are using fluorine as a crystallizing agent to grow crystals of mica without using high pressure.

(Continued on p. 54)

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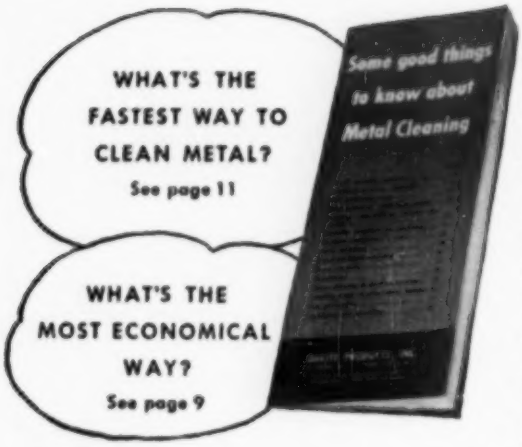
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New Developments

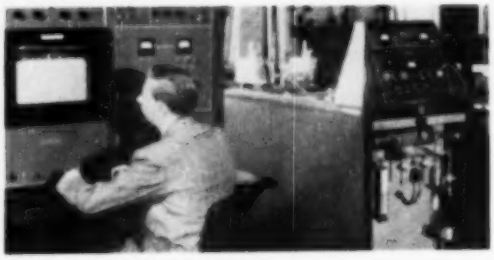
SUBMINIATURE RADIO TUBE

Developed by Air Matériel Command's Components and Systems Laboratory, a new subminiature radio tube, called a "fieldistor," is now in its early stage of development. Being only one-ninetieth the size of a standard radio tube, the fieldistor resembles the end of an eye dropper.

The small size and structure of the fieldistors will enable them to better withstand engine vibration, gunfire damage, and landing shock which literally shakes the life out of ordinary tubes. Since modern aircraft use hundreds of tubes, the space and weight saved by use of the devices, plus their greater resistance to abuse, mean longer aircraft range at reduced operating costs. Another big advantage of the new tube is that it uses such a small amount of current that most batteries can be eliminated.

ANALYTICAL MASS SPECTROMETER

An instrument which separates molecules making up a gas according to their weights is being used by the Geophysical Research Directorate of the Air Force Research Laboratories to



The analytical spectrometer in operation.

study gases of the upper atmospheres. The instrument, called the "analytical mass spectrometer," will be used in new studies of the composition of the earth's atmosphere which may lead to development of new weather forecasting techniques.

ENVIRONMENTAL LABORATORY

A scientific roughhouse in which military weapons such as mines, torpedoes, and depth charges are dropped, bounced, and otherwise systematically mauled to expose their weaknesses, recently was put into operation at White Oak, Md., by the Navy's Bureau of Ordnance.

Known formally as an "environmental laboratory," the $4,000,000 new section of the Naval Ordnance Laboratory has but one purpose—to see if it can destroy or damage the products of other laboratories.

Technicians will seek to discover through a series of grueling tests how ordnance equipment is affected by shipping, climate, altitudes, manual handling, and the general wear and tear experienced from the time it leaves the manufacturer until the moment it is loosed against enemy targets.

NEW TRAIL RATION

Fifty picked men from the Army's Alaskan Command assigned to an isolated site in Alaska have conducted a rigidly controlled test of a new arctic trail ration designed by the Quartermaster Corps. Although light in weight, the trail ration provides 5,324 calories a day compared with the standard ration of 3,600 calories supplied troops in temperate climates. Its components contain all the nutritive elements believed needed to support health and vigor under the demands of high activity and subzero weather. The test is to show whether the ration measures up to all requirements.

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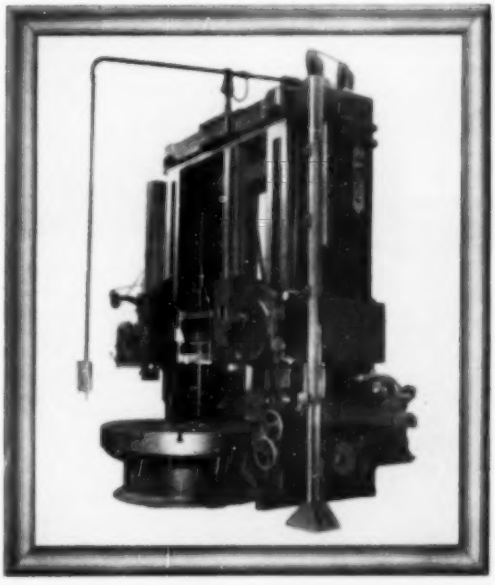

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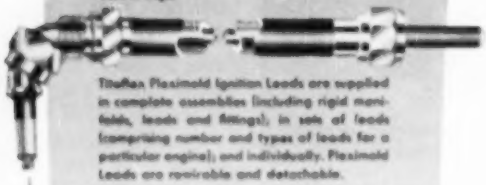

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COMMUNICATIONS

"SPREADING THE WORD"

THE EDITORS—Mr. Gleason's bibliography of literature on weapons in a recent issue of ORDNANCE is certainly a worthy help to the field of ordnance engineering—"spreading the word," so to speak.

To carry this further, would you kindly send me ten copies of the reprint of this article. I shall be grateful.

S. F. MUSSELMAN

Chicago, Ill.

A PEACETIME RESERVE

THE EDITORS—I believe that the peacetime Reserve should be organized along the following lines:

Let us presume that the General Staff in Washington plans to make a possible future invasion. Among the noncombatant categories required in such an event would be stevedoring in all its branches. The Reserve General Staff, which I propose be organized, would be told by the Regular General Staff to submit for its approval the stevedoring requirements needed to implement the plan, including man power, the type of landing operation, the latest techniques, the most up-to-date equipment, the ports in our own country needed to mount the invasion, etc.

After approval by the Regular General Staff, a Reserve Commanding General of Stevedores would be appointed whose duty it would be to enlist the man power in a Reserve Stevedore Command and set up his organization. The material needed would be planned for with the Nation's manufacturers.

In peacetime, small monthly wages would be paid by the Government to all accepted enlistees, say, for example, at five per cent of their base pay in time of war, and this would be tax-free. This would give ample incentive to the Reserves to keep their man-power reservoir filled.

In the last war there was a woeful lack of trained men, machinery, and devices needed for efficient logistical support of the armies. This was due to the fact that a peacetime Reserve had not been established from which to draw the men, and no thought had been given by civilians in peacetime to the many devices needed to carry on warfare where ordinary dockside facilities are nonexistent or destroyed. Inasmuch as eight or more noncombatants are needed for every combatant in modern warfare, only through the adoption of a plan of this type can we afford to maintain a peacetime organization which really will function when war comes.

HAROLD L. MACK

Carmel, Calif.

ENJOYS TECHNICAL ARTICLES

THE EDITORS—I have just finished reading one of your excellent technical articles, "Small Arms—King Size," which was very interesting and informative.

I wish you would publish another article on the latest developments in small arms. Being a company armorer in the New Jersey National Guard and a graduate of the Small Arms Mechanics School at Aberdeen I have a great interest in articles such as the one on recoilless rifles.

All in all, I feel ORDNANCE is an excellent magazine and I will never regret subscribing to it. It is just such a magazine that keeps all of us up to date in regards to national defense.

SGT. GEORGE SCHUYLER

Dunellen, N.J.

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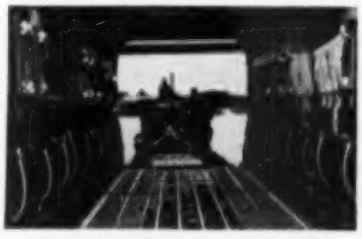

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AN-F-20	"Alodine"
	"Granodine" (Dip, Spray, and Brush grades)
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	(See also U. S. A. 3-213)
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Seeds of Treason. By Ralph de Toledano and Victor Lasky. New York: Funk & Wagnalls Company. 270 pp. $3.50.

THE revelations in this book, while they were being developed piecemeal publicly, were not nearly as startling as they are when presented within the confines of one volume. The authors, both of whom are trained reporters, give an objective presentation of the developments leading up to the current disloyalty investigations.

Even to those of us who have followed closely the career of Alger Hiss, many pages of this book present new material in the way of records not hitherto generally available.

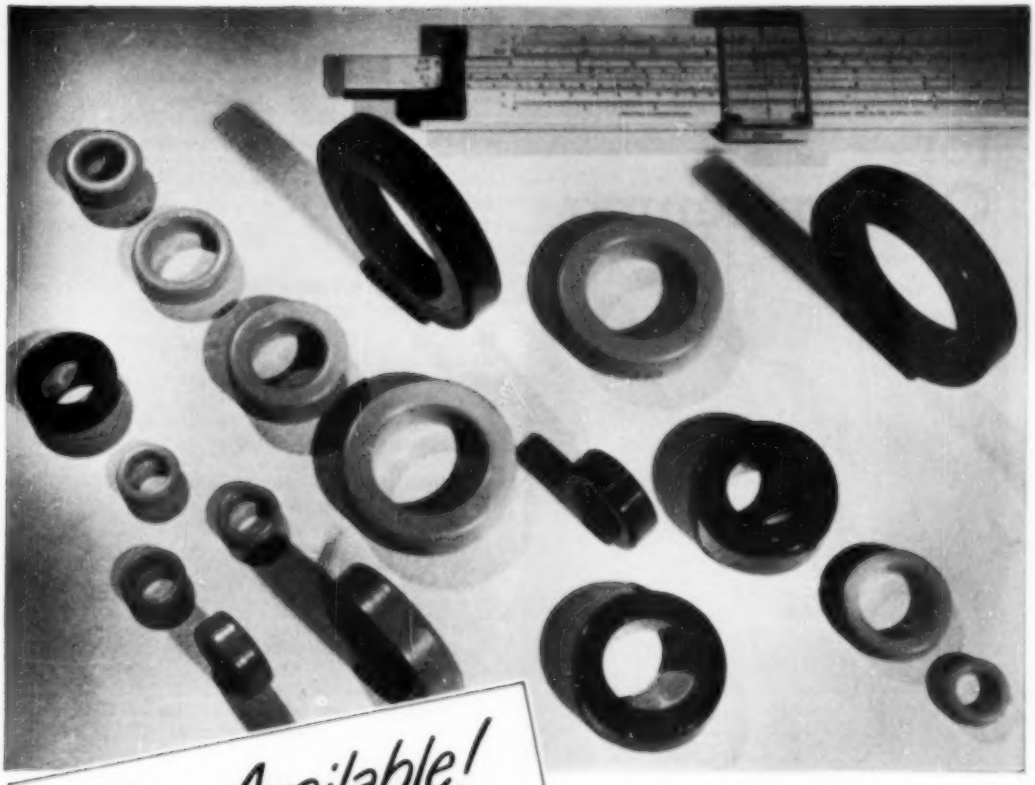
To have maintained the tempo of objectivity which marks this work is an achievement of the first magnitude on the part of Messrs. Toledano and Lasky. It is a record to stand for many years as an example of disloyalty from small beginnings to mighty climaxes.

One particular observation in the career of Alger Hiss, who is the subject of the major portion of this book, may be worthy of special mention in these pages. He was counsel to the Nye Senate Investigating Committee which weakened the national defense of the United States during the years preceding World War II when military strength should have been of greatest concern.

This book describes some of the developments of those days, but by no means all. The complete story of that phase of our national defense record is yet to be written. It is a sorry one. To weaken the national defense of one's country through ignorance is sad enough—to do so with malice aforethought is treason indeed. The attitude of the former Nye Investigating Committee exposed horrible herbs for the seeds of treason.—L.A.C.

Phantom Fortress. By Bruce Lancaster. Boston: Little, Brown & Company. 310 pp. $4.

"PHANTOM FORTRESS" principally describes the legendary operations of Brig. Gen. Francis Marion, the famous "Swamp Fox" of the War of Independence. Maj. Gen. Nathanael



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Book Reviews

Greene and Light Horse Harry Lee also appear in Mr. Lancaster's latest historical novel of those South Carolina campaigns which played their part in the over-all American victory.

The author has presented the picture of Marion's guerrilla campaigns with his usual accuracy, lamenting, as he frankly states in the foreword, the dearth of historical records.

For those interested in the hit-and-run potential of mobile warfare, more especially against an invader occupying one's homeland, the account of Marion's tactics is excellent. Otherwise the story not infrequently drags.—MELVIN M. JOHNSON, JR.

The Story of the Mexican War. By Robert Selph Henry. Indianapolis: Bobbs-Merrill Company. 424 pp. $4.50.

ROBERT S. HENRY'S condensed narrative history of the war with Mexico is thoroughly worthy to take its place alongside his "Story of the Confederacy," which received Dr. Freeman's highest praise. Though not designed as "source" history, it is quite well documented and employs an expansive bibliography including numerous manuscripts.

This conflict has received scant attention from historians, though it was the first to be covered adequately by the press. The author's outstanding service to history is his well-proved overthrow of the generally accepted notion that this was a case of ruthless expansion against a weak and helpless neighbor. He conclusively shows that it was forced by the vain political dictators at the head of a quite anarchic and unstable "so-called republic."

The book is written with complete objectivity by an author who is really competent in his military evaluation. The bravery of Mexican troops is recognized but so is the imbecility and vanity of their commanders who occasionally did their "paper work" while their men were in battle! The excellent Mexican lancers soon learned, as had the French, that cavalry was worthless against well-trained infantry. And American artillery beat down all opposition as it had done in 1812-1815. Once more, especially in the engineers and the guns, West Point had justified its existence.

However, the American forces were hampered by their civilian transport and by sick and brawling volunteers. The outrages against conquered civilians, which so disgraced Taylor's army in Northern Mexico, were kept at a minimum by Winfield Scott who introduced the first American military government in history and thereby kept his forces on a tight rein.

The conflict brought out a lesson which went virtually unnoticed at the time—that American firepower was superior to anything it encountered and that if American attacking infantry were to be stopped at all they must be stopped at the start of their attack.

Henry's evaluation of ordnance is very good, but attention to the details of "the tools of war" is sadly lacking, as it is in the great bulk of military history. Certainly the author has written one of the most pleasing and satisfying historical accounts of the past decade.—F. W. F. GLEASON.

Peace or War. By John Foster Dulles. New York: The Macmillan Company. 266 pp. $2.50 in cloth; $1.00 paper-bound.

MR. DULLES has rendered many notable contributions to the foreign affairs of the United States. In this book he describes not only his philosophy for maintaining peace among nations but presents for the first time in cohesive form the narrative of the many important developments during and since the Second World War. These relate not only to his role in our alleged nonpartisan foreign policy programs but also to his part in the work of the United Nations organization. In both cases what Mr. Dulles has written is objective and complete.

The most notable portions of "Peace or War," in this review-

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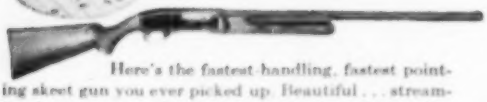

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er's opinion, are those relating to the development and use of regional defense pacts. The author has had an important share in this phase of our foreign policy which is now materializing in the implementation of the North Atlantic Pact as it has in the application of Hemisphere Defense. The consoling and inspiring thing about Mr. Dulles' writing is that the United States Government has now, as in recent years, a public servant of high character, great learning, and intense desire for peace. More of his type at the council tables of the world might bring the millenium much faster!—L.A.C.

Combat Command. By Rear Adm. Frederick C. Sherman, Ret. 427 pp. $5.

ADMIRAL SHERMAN has here turned out a document not only possessing remarkable literary style but having tremendous military importance as well. It is a vivid, gripping tale, covering every phase of the naval war in the Pacific, written by a man who was there and who played a dominant part in its strategy and action.

Admiral Sherman's writing moves with the speed of the aircraft he obviously loves so dearly, and this reader found the book almost impossible to put down until finished.

The story is told in chronological order, starting with Pearl Harbor and the events leading up to it. The discussion of tactics and strategy—viewed and evaluated in the light of today—is handled with fairness and impartiality. All the services receive appropriate shares of praise and criticism, and in this respect, too, Admiral Sherman avoids the shoals which wrecked many writers who attempted to cover the last war by arbitrarily favoring one service over the other.—CLARENCE CRAIG.

Ack-Ack. By Gen. Sir Frederick Pile. London: George G. Harrap & Company, Ltd. 410 pp. $4.25.

GENERAL PILE was General Officer Commanding-in-Chief, British Antiaircraft Command in England from 1939 to 1945. He directed English, American, and Canadian antiaircraft units operating in England during the last war. His book is a most authoritative work on the subject. He is frank in telling of the difficulties encountered in trying to make his command function effectively.

Initially his command had little personnel, little equipment, and little ability to hit a target. But by 1945 General Pile was able to say that he had caused appreciable losses to piloted German aircraft which had attacked England and had shot down more than half of the pilotless aircraft (V-1 buzz bombs) which had been fired at England by the Germans.

Although the book will be of primary use to antiaircraft artillerymen, it will also be valuable to Ordnance personnel who may be connected with development, supply, or maintenance of antiaircraft equipment. Much can be learned from it concerning the utility of antiaircraft guns of all kinds, antiaircraft ammunition, including proximity fuzes, and fire-control equipment, including optical, acoustic, and radar types. General Pile describes many of the difficulties encountered in obtaining enough improved antiaircraft guns and enough improved antiaircraft fire-control equipment.

Methods of protecting cities against air raids in future wars may be gleaned from the narrative. Constant demands to furnish protection to numerous English cities and army, navy, and air force installations had to be met by General Pile. From his accounts it appears that there is probably no limit to the amount of antiaircraft protection needed to satisfy all demands. This protection is sometimes merely that resulting from the comforting sound of guns rather than from hitting enemy aircraft. General Pile was criticized several times because his guns did not make enough noise during a raid or because his ammunition expenditure rate was not high enough. (Continued on p. 64.)

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U. S. A. 50-60-1C	Bonderite 100, 125, 160, 170, 180
U. S. A. 3-213	
Type I	Parco Cleaner 250
Type II	Parco Cleaner 260
AXS-1245	(See JAN-C-490)
Navy Aeronautical M-364	Parco Compound—Parco Powder

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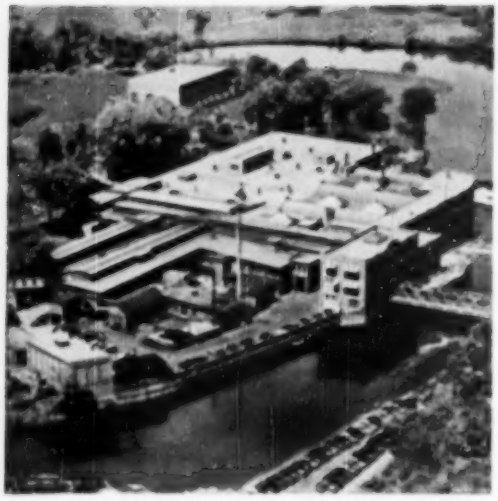

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Book Reviews

The relative value of fighter aircraft and antiaircraft guns for protecting cities is given extensive treatment. England found it desirable to consolidate the operational activities of fighter aircraft and antiaircraft guns. General Pile's Antiaircraft Command was operationally under the organization known as Air Defense of Great Britain, headed by a Royal Air Force officer who also had the Royal Air Force Fighter Command under him.

While the U.S. was operating in France and Germany we tried the same type of organization when we placed all rear-area antiaircraft artillery organizations under the operational control of the Ninth Air Force. General Pile's command was a kind of stepchild in the Royal Air Force, and the IX Defense Command was probably a similar stepchild in the Ninth Air Force.—PHILIP SCHWARTZ.

Omnibus of Time. By Ralph Milne Farley. Los Angeles: Fantasy Publishing Company. 315 pp. $4.50.

RIGHT off—here's your collection of science-fiction. One thriller after another parades in this galaxy of seventeen of the author's best short stories of the time-travel classification. Physicists, aerodynamicists, ballisticians, and, above all, just plain readers of thrillers will find much enjoyment and enlightenment in this book.

As you will see as you read on, all these stories hinge on your definition of time. Despite the elucidation on the subject in the final chapter, the author has composed a special definition exclusively for his fellow members of the A.O.A.: "Time is what we don't have any of at the start of World War III."

Ralph Milne Farley is none other than Roger Sherman Hoar of Milwaukee, Wis. Distinguished as an expert in patent law and as an official of the Bucyrus-Erie Company of South Milwaukee, Colonel Hoar served in the Army Ordnance Department in the First World War. Indeed, the episode which starts off "The Invisible Bomber" (one of the stories in this volume) actually occurred as related to a battery which he was firing at the water range at Aberdeen Proving Ground in 1919 or 1920.

Colonel Hoar is a charter member of the A.O.A. and of the Milwaukee Post. He is one of the most active and loyal supporters of the Ordnance cause. But until now his identity as Ralph Milne Farley has not been disclosed in these pages. That it should be made known now is appropriate—we think—because one of the best stories in this collection is called "The Man Who Met Himself." It's about time Colonel Hoar's many friends in the Ordnance fraternity met himself in his other person—Ralph Milne Farley. Identities aside, "Omnibus of Time" is great reading when you want to relax!—L.A.C.

Mr. Midshipman Hornblower. By Cecil S. Forester. Little, Brown & Company. 330 pp. $3.50.

ONE of the leading historical novelists of our times, English-born Cecil Forester created an ageless English naval officer of the Napoleonic Wars period in the leading character of his novel, "Captain Hornblower."

A master storyteller of action, character, and adventure scene, the technical skill, tactical description, and historical accuracy of Forester's greatest novel won acclaim from every side. Even so, he had written several brilliant pieces before, such as "The General" and "Payment Deferred."

"Captain Hornblower," written in the inspiration of England at war with Hitler, was followed by "Commodore Hornblower" and finally by "Lord Hornblower," the last chapter of which was written while Forester was on board a U.S. battleship. He announced that this ended the saga of his immortal hero of modern fiction.

Then, much to every one's joy, *The Saturday Evening Post*, enthusiastic publishers of Hornblower serials, announced a new

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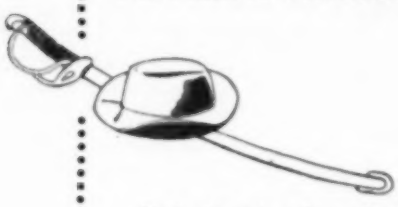

Captain SAM GRANT

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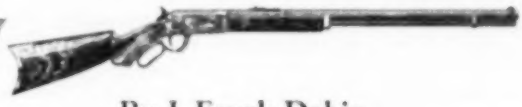

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NO PLACE TO HIDE, *by David Bradley.* What the atomic bomb can do to ships on water and to installations on land, and thereby to human beings. Retail $2.00. To members $1.60.

A RIFLEMAN WENT TO WAR, *by H. W. McBride.* A first-hand account from World War I of the use of the military rifle in war, especially in sniping. Retail $3.50. To members $2.49.

THE SECOND WORLD WAR, *by Maj. Gen. J. F. C. Fuller.* Strategical and tactical study of World War II. Retail $5.00. To members $3.49.

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series concerning the previously untold youth of Sir Horatio, Lord Hornblower. How he entered the square-rigged British naval service as a midshipman and rose after many naval battles to lieutenant is the substance of Forester's latest volume, "Midshipman Hornblower."

Thus, happily, the brilliant author of "Captain from Connecticut," "Rifleman Dodd" (which General Eisenhower read during Normandy), "The Gun," "African Queen," "To the Indies," "The Sky and the Forest," "The Peacemaker," and "The Ship," continues to round out the Hornblower fiction which this reviewer is certain will endure many centuries as a part of our permanent literature.—MELVIN M. JOHNSON, JR.

Careers for Young Americans: In the Army and After. By Reuben Horchow. Washington: Public Affairs Press. 226 pp. $3.25.

GEN. OMAR N. BRADLEY in his foreword to this volume pays tribute to the importance of the U.S. Army's new personnel setup. No longer may the Army be regarded as the refuge of the unemployed and the misfit. Small in comparison to European and Asiatic forces, it relies on the high quality and superb over-all training of its personnel.

This over-all training of our Army today and what it can mean for the young men and women who plan an Army career or civilian careers after thorough Army training is clearly depicted in Colonel Horchow's volume. The many documents which describe the features of Army life have been gathered and coördinated with up-to-the-minute news in one time-saving and error-avoiding compendium. Its value to the prospective recruit and his family is most obvious.—F. W. F. GLEASON.

Karamojo Safari. By W. D. M. Bell. New York: Harcourt, Brace & Company. 298 pp. $3.75.

THIS is the account of a 14-month elephant hunt in the wilds of Kenya back country. Bell, the only white in the party, brought out 354 tusks which, after all expenses, netted him $20,000. Needless to say, this cannot be duplicated today, but the turn of the century brought together the great game herds, free shooting, and the modern magazine small-bore rifle. And Bell, credited with 1,000 elephants and innumerable other game, was the man to exploit the situation. For he was one of the few African hunters who really knew as well as loved his weapons. Throughout the volume he expounds his deep knowledge of weapons, cartridges, and their use —all of which is gathered in a 9-page appendix to drive home the fruits of his vast practice.—F. W. F. GLEASON.

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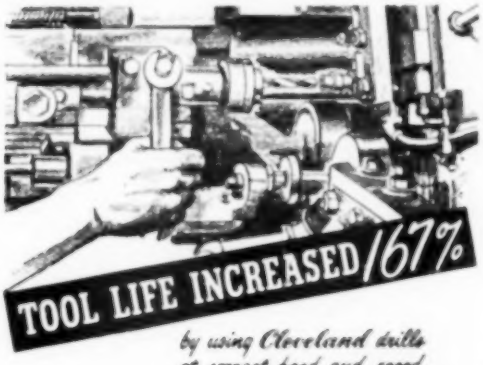

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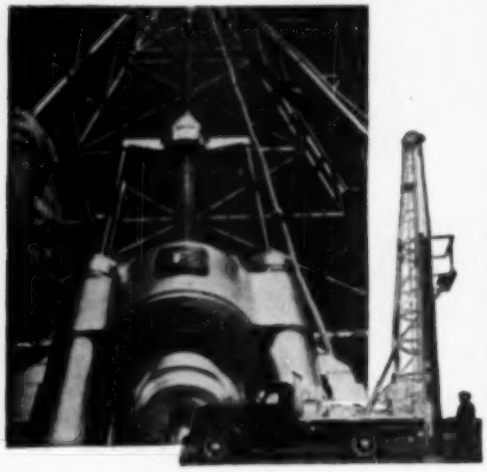

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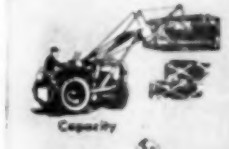

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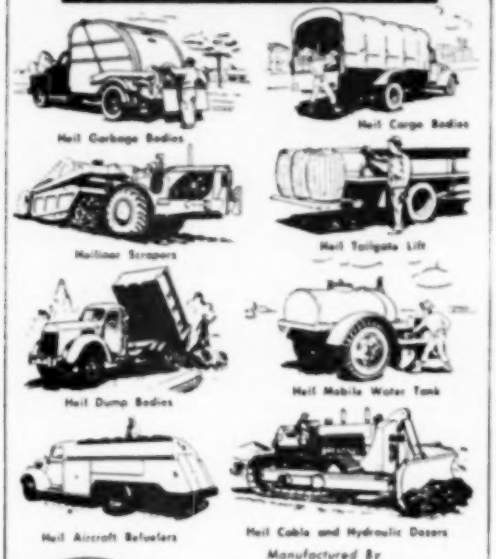

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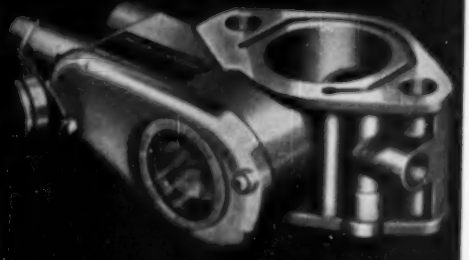

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The Index to Volume XXXIV of ORDNANCE, with title page for binding, is now available. It covers subjects in the following 1949 and 1950 issues: July-August (No. 175), September-October (No. 176), November-December (No. 177), January-February (No. 178), March-April (No. 179), and May-June (No. 180). It is arranged alphabetically by subject and author. Copies may be obtained free of charge upon written request.

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[ORDNANCE is set up, printed, and bound for the American Ordnance Association by the William Byrd Press, Inc., Richmond, Va.]

THE NEW YORK TIMES, SUNDAY, JANUARY 15, 1950.

U. S. SERVICES LEAN ON INDUSTRY GROUP

Ordnance Association Helps Solve Many of Problems of the Defense Forces

Cooperation between industry and the armed forces advanced on a broad front during 1949, according to James L. Walsh, president of the American Ordnance Association.

The solution of production engineering problems referred to the association last year by the ordnance organizations of the Army, Navy and Air Forces was its general goal. More than 800 industrial leaders are in consultation on the technical needs of the three defense services through the forty active committees of A.O.A., Colonel Walsh revealed.

Commenting upon the association's services, Secretary of Defense Louis Johnson wrote recently:

"I have been very favorably impressed with the tangible evidence of cooperation by American science, engineering and industry in the solution of the ordnance problems of the Armed Forces—as demonstrated by the various reports prepared by the technical divisions and committees of the American Ordnance Association, for submission to appropriate officers of the National Military Establishment."

Knowles Directs Committees

The general direction of committee work is under Harvey C. Knowles, A.O.A. vice president and a vice president of Procter & Gamble Company of Cincinnati, Ohio. The breadth of coverage of this work is indicated by the titles of divisions and committees which range from fire control instruments and rockets, bombs and ammunition, to small arms, for example.

As an illustration of a typical task of committee operation, a recent meeting of the rocket committee was held at Picatinny Arsenal, Dover, N. J., under the chairmanship of Edward A. Ash of Detroit, Mich. Throughout the two-day sessions, during presentation of sixteen technical papers by spokesmen for the armed services and industry it was shown that forty-four important rocket problems received from the Armed Forces had been completed since the last meeting.

New student chapters of the organization are being formed at Portland, Ore., Schenectady, and at The Citadel, Charleston, S. C. Chapters are functioning in twenty-eight other cities. All chapter activit...

Looking way *ahead*

THE American Ordnance Association, as indicated by the accompanying clipping, is a forward-looking group of American citizens pledged to scientific and industrial preparedness as a guaranty of peace.

The A.O.A. has many characteristics which add to its stature and strength:

- It is a volunteer civilian organization founded in 1919.
- It is composed of individual citizens.
- It is not operated for profit.
- It does not try to influence legislation.
- It stands ready to help Ordnance preparedness—ashore, afloat, aloft.
- It has but one purpose—peace through strength.

If you are not a member, full information is yours for the asking. The cost: A little more than a penny a day at $4.00 a year, a little less than a penny a day at $10.00 for 3 years.

AMERICAN ORDNANCE ASSOCIATION

The Science-Industry-Ordnance Team in Action

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ARMAMENT TECHNOLOGY

In this section of Ordnance *are published articles on ordnance research, development, manufacture, and related subjects of a more detailed and technical nature than those generally appearing elsewhere in this magazine. Also included are studies on Ordnance service in the field forces, logistics, and allied phases of field operations. Ordnancemen will thus find assembled in convenient "package" form information which should prove of especial value to them.*—The Editors.

Ordnance Service in the Field

A New Flexible Plan of Arms Maintenance and Supply

THREE important elements for insuring success in war are man power, firepower, and mobility. Ordnance service in the field has a major rôle in attaining and preserving these elements. By means of extensive application of mechanical, electrical, electronic, and explosive science, our Army has greatly amplified the combat effectiveness of the individual soldier, thus multiplying the man power available for national defense in time of war. The mechanical readiness of ordnance weapons and the supply of ordnance ammunition to the unit ammunition trains control the firepower of an army in the field. The mobility of an army in the field is measured by the ability of its vehicles to move man power and firepower throughout the combat zone at the will of the commander.

Ordnance service in the field supplies and maintains the ordnance equipment and ammunition so necessary to the success of an army in the field, and for this reason it is an indispensable part of armies, independent corps, task forces, and logistical commands. Ordnance service in the field extends the technical services of the Ordnance Department to the using organization, and the degree of accomplishment, or lack of accomplishment, of that service establishes the reputation of the Ordnance Department in the eyes of the army.

Actually, ordnance service in the field is the service-dealer organization of the Ordnance Department, and unless the service rendered is complete, convenient, and continuous, the customer or 'using organization is entitled to complain, since, unfortunately for him, he cannot take his service elsewhere. Because of this virtual monopoly it is necessary that each individual member of ordnance service in the field be firmly convinced that the sole reason for the existence of his unit is to render an essential service to the Army. It is highly improper for any operating procedure or plan of ordnance service in the field to be predicated on any basis other than the needs and convenience of the customer.

Early Beginnings

The ordnance service utilized by an army in the field is of comparatively recent origin. Prior to World War I, our Army did not have an ordnance service for use in the field. The ordnance equipment of that period was quite simple and did not require the extensive field repair and depot rebuild shops later found to be necessary. The Army was dependent on animal-drawn transport, and each organization carried with it a supply of spare parts for the repair of its ordnance equipment. Additional spare parts and repair services were furnished by the nearest permanent Ordnance establishment. Each organization had a small complement of Ordnance enlisted men attached to it for the care and preservation of its ordnance equipment.

The mobilization of the Army on the Mexican Border and the punitive expedition into Mexico in 1916 resulted in a heavy concentration of troops and equipment along the border at a considerable distance from the permanent Ordnance establishments and created a situation that demanded the organization of a mobile ordnance service.

Repair units equipped with machine tools mounted in trucks and operated by civilian personnel were set up at different places along the border. These units demonstrated the advantage of mobile repair facilities and provided training for Ordnance personnel in the maintenance of ordnance equipment in the field.

The success of these units and the value of the work they accomplished led to the organization of the mobile ordnance repair shop upon our entry into World War I. This unit consisted of three officers and forty four enlisted men. The technical equipment, all of

This timely analysis will be especially welcome to all present and former Army Ordnance officers—Regular, Reserve, and National Guard. The text is based upon original data compiled by Brig. Gen. H. A. Nisley (U.S. Army, Ret.), with the assistance of various officers at Army Field Forces Headquarters. General Nisley, formerly Ordnance Officer at Headquarters, Army Ground Forces, served with distinction for many years in the Ordnance Department. During the Second World War he was Ordnance Officer of the Armored Force and later Ordnance Officer of General Bradley's Twelfth Army Group.

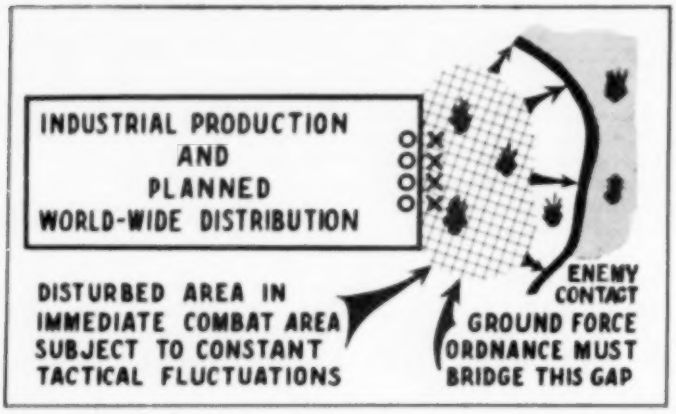

Fig. 1. The mission of ground ordnance in operations.

which was developed after we entered the First World War, consisted of artillery and small-arms repair shops and artillery supply trucks utilizing the then-current standard 4-wheel-drive truck and the light Dodge truck chassis. One mobile repair shop was provided for each division, and, in addition, a number of officers and enlisted men of the Ordnance Department were attached to the regiments and battalions of the division.

As the war progressed, a heavier type of mobile repair shop was developed for assignment to the brigades of motorized heavy artillery and were designated as Heavy Artillery Mobile Ordnance Repair Shops. These heavy shops were well equipped with machine tools mounted on trucks and special trailers and consisted of two identical sections of thirty-five vehicles each. After World War I, these two types of mobile repair shops became the basis for the Ordnance Medium Maintenance Company and the Ordnance Heavy Maintenance Company.

In addition to these two maintenance companies, the Ammunition Company and the Depot Company were established. The medium-maintenance company was assigned to the old-type square Infantry division and to the Cavalry division. In a peacetime establishment, these medium-maintenance companies consisted of one officer and forty-nine enlisted men. Since our peacetime Army never concentrated a force as large as one infantry division for extended maneuvers, there was no real test of the adequacy of this unit.

Had a force as large as a corps ever been assembled, it would have been provided with one heavy-maintenance company, one ammunition company, and one medium-maintenance company to support the corps artillery brigade. The mechanized Cavalry brigade was supported by a heavy-maintenance company of one officer and 139 enlisted men, and this unit was utilized as a test organization for new types of ordnance technical equipment.

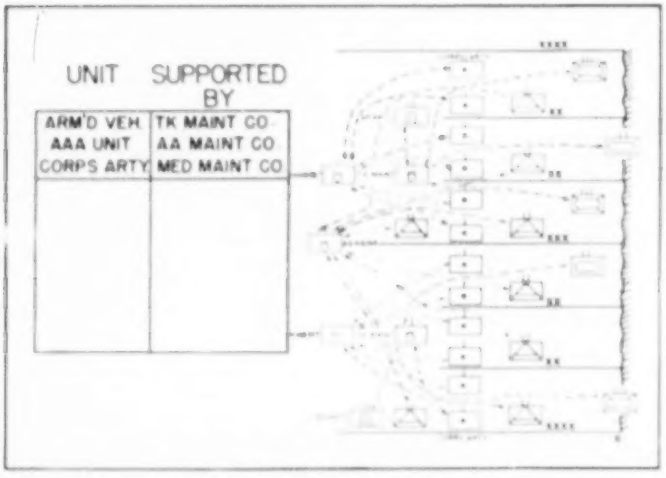

Fig. 2. Past concept of ordnance support.

Further Organization

The war in Spain and the rise of the fascist states caused the War Department to conduct a test of the organization of the Infantry division with three regiments instead of four. This reorganization dropped the medium-maintenance company from the division and replaced it with a divisional light-maintenance company. In 1940 the mechanized Cavalry brigade was expanded into two armored divisions and several separate tank battalions.

An Armored Ordnance Battalion, consisting of a headquarters company and two ordnance maintenance companies, was organized for the armored division, and a special Heavy Maintenance Company (Tank) was provided for the tank battalions. The expansion of the Army and the call of the National Guard into Federal service resulted in the organization of many more ordnance units.

FM 9-5 published July 11, 1942, again expanded the ordnance service provided for a field force. The Ordnance Battalion (maintenance and supply) was assigned to the Type Field Army and included the elements necessary to operate the army general supply depots and the field shops of the army. It was designed to provide ordnance service to army troops and to support the effort of the corps maintenance battalion. Its composition was indefinite and was not stated in specific terms. The Ordnance battalion (maintenance) was assigned to the corps and normally consisted of three medium-maintenance companies under the command of the corps Ordnance officer. The Ordnance battalion (ammunition) was assigned to the type

field army on the basis of two battalions of six ammunition companies each, and operated under the control of the army Ordnance officer.

In August 1942 the Ordnance Department assumed responsibility for the field maintenance of general-purpose vehicles and took over three additional units formerly assigned to the Quartermaster Corps. These were the Medium Automotive Maintenance Company (Q), the Heavy Automotive Maintenance Company (Q), and the Motor Transport Supply Company (Q).

Behind the army rear boundary in the communications zone, ordnance depot service was provided by the Ordnance Base Regiment, a 4-battalion organization of some 3,000 men. As new techniques of war were encountered, special Ordnance units were organized to meet new requirements. The bomb-disposal squad and company, the ordnance technical intelligence team, the ballistic team, and the floating maintenance and supply barges used in the Pacific area were the result of wartime needs.

The emphasis placed on antiaircraft defense caused the conversion of a few medium-maintenance companies into medium-maintenance companies (AAA). An examination of the organization and of the missions of ordnance units of this period shows that each was organized to meet a functional need as a new class of weapons or a new responsibility confronted the Ordnance Department.

There was, however, one notable exception. In 1942, prior to the assumption of the responsibility for the maintenance of general-purpose vehicles by the Ordnance Department, the Armored Force had consolidated its maintenance in one battalion. As the armored maintenance battalion was initially organized it consisted of a headquarters company and two ordnance maintenance companies. The Quartermaster battalion also included one Quartermaster maintenance company.

These three maintenance companies were placed in one battalion and each maintenance company was charged with equal responsibility for the maintenance of all types of ordnance matériel. This action simplified the maintenance problems of the using organizations in the armored division in that one Ordnance company was responsible for armament and vehicle maintenance of all types.

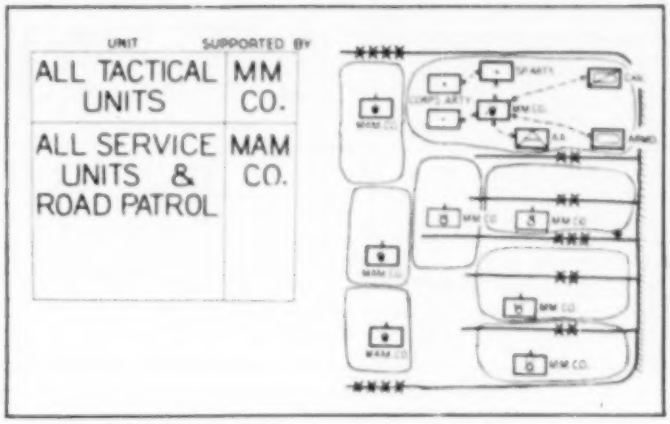

Fig. 3. Interim plan of ordnance support for all using units.

Distribution System

The distribution system of the Ordnance Department and the Army is highly developed and can generally be relied on to deliver ordnance matériel of the required types and in appropriate quantities to ports of debarkation in a theater of operations. Beyond this point ordnance service in the field must take over and distribute ordnance matériel to the customer when and where it is required and provide field and depot maintenance service throughout the theater of operations.

The conditions prevailing in the various theaters of operations of World War II had only two common features: (1) they were conducted in a disturbed area, and (2) the tactical situation fluctuated rapidly (Fig. 1). The piecemeal, hole-plugging system that grew out of the lethargy toward the subject of ordnance service in the field during the interval between the two wars did not provide the flexible service necessitated by the war of movement encountered in Europe and by the unusual environmental factors of the Pacific. The system was not adaptable to the tactics employed and did not insure continuous ordnance support as the normal circumstance.

In actual practice the problem was solved independently by individual Ordnance officers in different ways, with varying degrees of success. The resulting lack of uniformity in operating procedures complicated the training problem and introduced many administrative difficulties. This unilateral development precluded the establishment

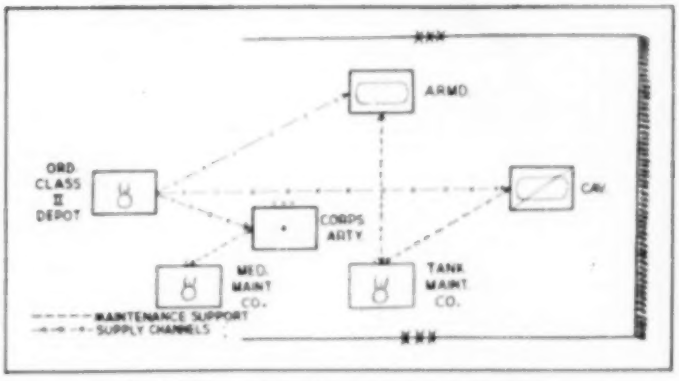

Fig. 4. Past concept of ordnance supply and maintenance.

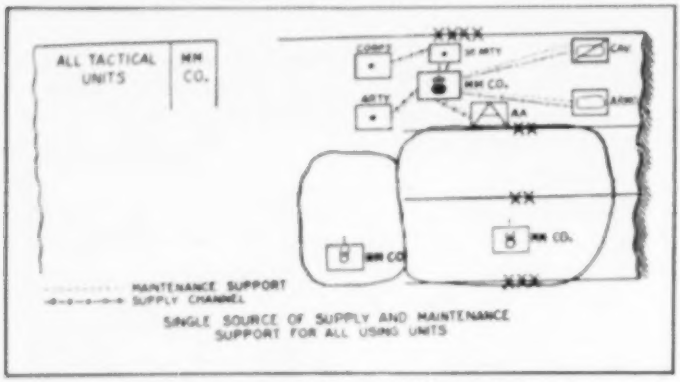

Fig. 5. Interim concept of ordnance supply and maintenance.

of a uniform doctrine for ordnance service in the field and the modernization of texts and manuals. It also had the serious disadvantage of requiring Ordnance officers assigned to duty in the combat zone to learn a new theory of ordnance support and prevented the use of the extensive training that many of them had received in Ordnance Class II installations in the zone of the interior.

A fundamental principle for the future is apparent: There must be one system of ordnance service in the field for peacetime and for war; for zone of interior operations and for the theater of operations. The standing operating procedures developed for peacetime operations must be sufficiently simple and flexible to withstand the disrupted conditions and fluctuations of the combat zone. The mobilization base must be broadened and strengthened by insuring that the peacetime system of ordnance service in the field can be expanded into a system that will be operable in a theater of operations without undergoing revolutionary change and that can be adapted to meet changing operational conditions.

The Infantry division of World War II had attached to it a tank battalion, a tank-destroyer battalion, and an antiaircraft battalion. The organic divisional light-maintenance company was capable of supporting artillery, small arms, instruments, and general-purpose vehicles assigned to the Infantry divisions; however, for the support of the tank battalion and the tank-destroyer battalion the division Ordnance officer was dependent on a heavy-maintenance company (tank) provided by the army and generally located near the corps rear bound-

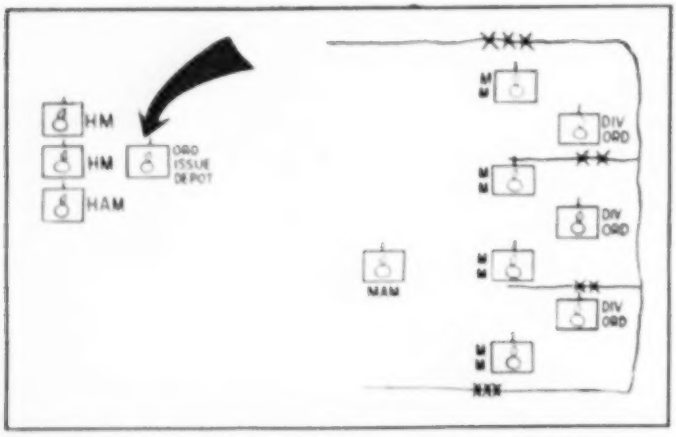

Fig. 6. The issue depot interim plan of ordnance support to users.

ary. For antiaircraft maintenance he was dependent on an antiaircraft maintenance company also provided by the army.

The divisional light-maintenance company was not capable of providing full support for the division during periods of active operations and was dependent on the assistance of a medium-maintenance company also provided by the army and located near the corps rear boundary (Fig. 2).

The Infantry division Ordnance officer was actually dependent on four Ordnance companies to maintain his matériel, and he had to consult four company commanders before he could answer the division commander's query as to the operational readiness of his equipment for tactical operations. Interim solutions were accomplished on the spot by the divisional Ordnance officer and the various company commanders to which he was obligated for support, but frequent transfers of the division between corps and army constantly disrupted such arrangements.

Specialized Units

It can readily be seen that there were several different specialized types of ordnance-maintenance units to support the nondivisional organizations. Theoretically, the heavy-maintenance company (tank) supported all armored and tank-destroyer battalions wherever located. The medium-maintenance company (AAA) supported the weapons of all antiaircraft artillery battalions, no matter how scattered, but could not maintain their tractors or self-propelled mounts. The medium-maintenance company was required to look after the corps artillery and other nondivisional combat organizations (Fig. 2).

This picture could be made materially worse by adding the army heavy-maintenance company for the support of the army heavy artillery. Certain missions developed in every army area which had to be accomplished although no suitable company of the proper specialized type had been made available. A survey of the history of Ordnance companies serving in the European theater indicates that thirty-five per cent of the time Ordnance companies were employed on missions differing from that for which they were organized, equipped, and trained.

Each army Ordnance officer solved

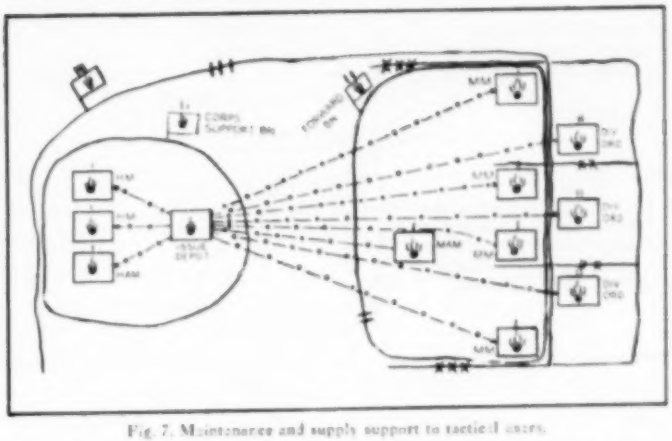

Fig. 7. Maintenance and supply support to tactical units.

his own particular problem in his own way by using available companies for missions other than those for which they were intended and frequently employed them on a mission for which they were not particularly suited. Such procedures were wasteful of both man power and equipment but did provide close and continuous ordnance service to the tactical ordnance-service units in rapidly changing tactical situations.

Tables Revised

The after-action reports of Ordnance units and major commands in all theaters of operations, as well as the personal experiences of World War II Ordnance officers, have been studied and analyzed. As a result of these studies, tables of organization and equipment for Ordnance units have been revised and published. These tables correct the deficiencies noted above. Ordnance units have been reorganized; loading tests have been conducted, and practical field tests have been made in connection with combined exercises such as Miki, Sweetbriar, and Portrex.

Lest we be accused of falling into the common military error of fighting the last war, a program for analyzing and forecasting the requirements for new types of Ordnance units and for changing the current series of tables of organization has been established. It is probable that each table of organization will be reorganized at least twice in the next three years.

One study must be directed toward the implementation of the career-management plan which will call for a revision of the military occupational specialties included in each table. A second revision will be necessitated by the study conducted by the Army Equipment Policy Panel directed toward the simplification and standardization of equipment in the Army.

The complexity of individual pieces of equipment in the type field army has increased immeasurably in the last few years. Everything possible is being done to simplify the training problem in so far as the user of the equipment is concerned. All this, however, multiplies the load that will be absorbed by the field maintenance repairman and depot rebuilder of ordnance service.

At a recent conference at Detroit Arsenal it was said: "We are now making our tanks so simple that a man can be taught to drive them in one afternoon, but the ordnance repairman and depot rebuilder each must be both a scientist and an engineer."

The density of equipment has also been increased as can be understood when it is realized that the field artillery battery now includes six pieces instead of the four which it had during World War II. The Infantry division now has approximately the same amount of armor that was provided for the Armored division of 1942.

However we must not defer the establishment of a uniform doctrine on ordnance service in the field in the hopes that we may achieve stability of design and reach a saturation point in the density of ordnance equipment in the Army. It is preferable to adopt a system incorporating all the changes that can be anticipated now and to make periodic revisions. Such a system is in effect for the type field army and has been approved for use in Army schools for both resident and nonresident training.

Interim Organization

This system of ordnance service in the field is referred to as the Interim Organization of Ordnance Service in the Field. The divisional maintenance company of the Infantry and of the Airborne division and the maintenance battalion of the Armored division as reorganized are capable of supporting all types of equipment found in those divisions, and it should no longer be necessary for the division Ordnance officer to contact three or four separate company commanders to determine when his equipment will be repaired and returned to him.

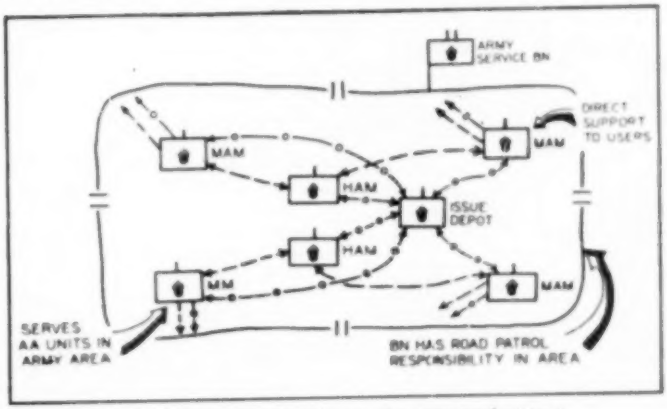

Fig. 8. Maintenance and supply support to army service troops.

This has allowed us to eliminate the special organization known as the heavy maintenance company (tank) and the medium maintenance company (AAA) since the capabilities formerly attributed to these units are now incorporated in divisional ordnance service.

We would like to close our direct-support problem at that point, but an examination of the equipment of non-divisional units shows a vast difference in the ratio of armament to general-purpose vehicles to exist between the combat, combat-support, and service units distributed throughout the corps and army service areas. This disparity is too great to permit the adoption of a universal maintenance company; therefore, the medium automotive maintenance company is retained to support the small-arms and general-purpose vehicles in the proportions found within the combat-support and service units. Figure 3 shows the simplification of this mission.

Medium automotive maintenance companies are assigned areas of responsibility and are charged with the responsibility for road control and highway clearance to insure that disabled general-purpose vehicles are promptly recovered or repaired. Supply doctrine formerly followed the system used at posts, camps, and stations in the zone of interior as shown in Figure 4. A using organization should look to only one place—an ordnance maintenance company—for both supply and maintenance support. Divisional ordnance units and the medium maintenance companies both include the personnel and the means to replenish ordnance spare parts required by the organizational maintenance sections of using organizations (Fig. 5).

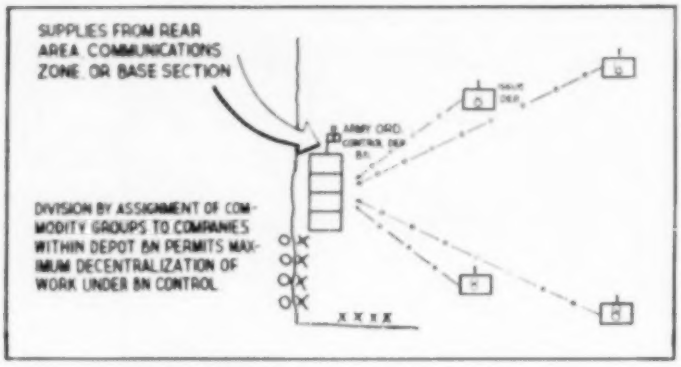
SUPPLIES FROM REAR AREA COMMUNICATIONS ZONE OR BASE SECTION
ARMY ORD. CONTROL DEP. BN
DIVISION BY ASSIGNMENT OF COMMODITY GROUPS TO COMPANIES WITHIN DEPOT BN PERMITS MAXIMUM DECENTRALIZATION OF WORK UNDER BN CONTROL
XXXX

Fig. 10. Army ordnance control main supply depot.

We may classify divisional ordnance units, medium maintenance companies, and medium automotive maintenance companies as direct-support units. Their mission is to inspect organizational maintenance and supply within the limits prescribed by the Ordnance staff officer exercising jurisdiction over field maintenance; to replenish spare parts consumed by organizational maintenance; to repair and return ordnance equipment for the using organization or to obtain replacement by a like serviceable item if repair cannot be effected promptly; and to assist the using organization recovery and road clearance.

These units all possess sufficient mobility to accompany using organizations as they displace, and the association of direct support is maintained as long as practicable.

To maintain the close relationship between supply and maintenance and to eliminate alibis and the need for excessive coordination, we have attempted to assure that each Ordnance commander have under his control the supply means required to accomplish his mission and in sufficient quantity to permit work to be accomplished at an even pace. However, there are many heavy assemblies used infrequently as well as the bulk of spare parts required to replenish the direct-support and heavy-maintenance companies. The field depot company carries this large reserve stock. It must possess a degree of mobility sufficient to insure that its stocks are readily available to ordnance maintenance units. It does not handle major items on wheels or tracks for reasons we will discuss later. We introduce the field depot company into the picture (Fig. 6) as a source of supply for all ordnance maintenance units, including divisional ordnance units.

We can still further improve our delineation of missions and eliminate confusion by establishing a proper command structure. In Figure 7 we show the first grouping of that type and the basic organization for the support of tactical using units. This forward battalion has the mission of direct support to all units in the corps section. The support battalion is concerned with the replenishment of supply to Ordnance units, the operation of the heavy-maintenance shops, and control of collecting

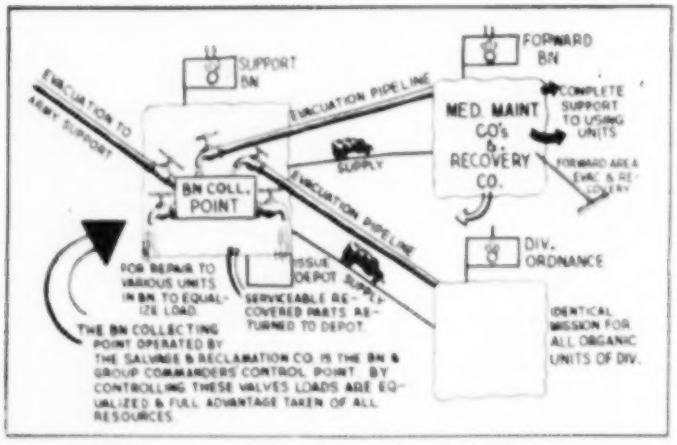
SUPPORT BN
FORWARD BN
EVACUATION TO ARMY SUPPORT
EVACUATION PIPE LINE
MED. MAINT. CO's & RECOVERY CO.
COMPLETE SUPPORT TO USING UNITS
SUPPLY
FORWARD AREA EVAC & RECOVERY
BN COLL. POINT
EVACUATION PIPE LINE
DIV. ORDNANCE
FOR REPAIR TO VARIOUS UNITS IN BN TO EQUALIZE LOAD
ISSUE DEPOT SUPPLY
SERVICEABLE RECOVERED PARTS RETURNED TO DEPOT
IDENTICAL MISSION FOR ALL ORGANIC UNITS OF DIV.
THE BN COLLECTING POINT OPERATED BY THE SALVAGE & RECLAMATION CO. IS THE BN & GROUP COMMANDERS CONTROL POINT BY CONTROLLING THESE VALVES LOADS ARE EQUALIZED & FULL ADVANTAGE TAKEN OF ALL RESOURCES

Fig. 9. Ordnance maintenance, supply, recovery, and evacuation service.

point operations. These two missions are sufficiently related so that we place both these battalions under the same Ordnance group.

In general, the same command structure is applied in the army service area, behind the corps rear boundary, where army service troops appear in quantity (Fig. 8). All the army service battalions are attached to the same Ordnance group.

Battlefield Recovery

We have mentioned battlefield recovery as a part of the responsibility of direct-support units. Early in the war there developed an urgent need for a means of augmenting the organic facilities of tactical units for battlefield clearance, the recovery of heavy fighting equipment, and the clearance of roads. The frequent and rapid displacement of combat units often prevents them from "tidying up" their own battle areas, and they must not be burdened with excessive recovery equipment. It was found necessary to develop the Recovery Company—an Ordnance unit highly skilled in battlefield recovery and evacuation and possessing the balanced recovery equipment to perform this essential task under battle conditions.

Another problem arose in connection with the control and classification of unserviceable ordnance equipment recovered from the battlefield or returned by using units. Battalion and group commanders must have a control point where priorities for repair can be applied and action taken to balance shop loads, and it was necessary to establish ordnance collecting points.

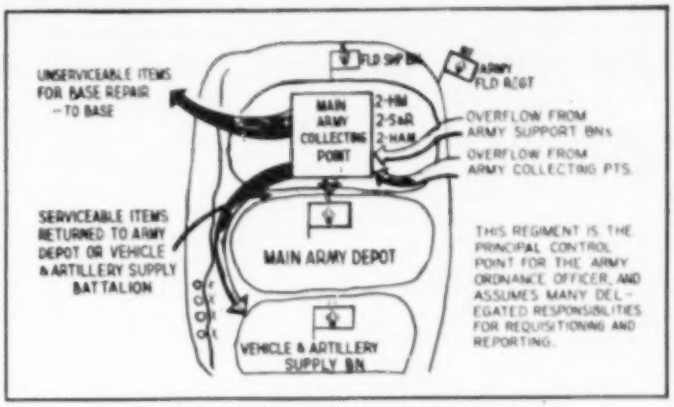
UNSERVICEABLE ITEMS FOR BASE REPAIR —TO BASE
MAIN ARMY COLLECTING POINT
2-HM
2-SAR
2-HAR
OVERFLOW FROM ARMY SUPPORT BNs
OVERFLOW FROM ARMY COLLECTING PTS.
SERVICEABLE ITEMS RETURNED TO ARMY DEPOT OR VEHICLE & ARTILLERY SUPPLY BATTALION
MAIN ARMY DEPOT
VEHICLE & ARTILLERY SUPPLY BN
THIS REGIMENT IS THE PRINCIPAL CONTROL POINT FOR THE ARMY ORDNANCE OFFICER, AND ASSUMES MANY DELEGATED RESPONSIBILITIES FOR REQUISITIONING AND REPORTING.

Fig. 12. Army ordnance field shop and collecting point.

The mission of ordnance collecting points includes classification of unserviceable equipment as to repairability; the balancing of loads in satellite shops; control of evacuation to the rear; evacuation to base shops of repairable assemblies; and the disassembly of nonrepairable items for the recovery of all usable materials.

Standard maintenance companies were employed to operate these collecting points, but this proved to be uneconomical since no standard Ordnance unit was able fully to employ its available skills and tools on this task. The Ordnance Classification and Reclamation Company has been organized in the interim system to discharge this mission. Collecting points manned by this unit must be located on road nets at points of natural traffic flow and near the center of the battalion or battalions they serve (Fig. 9).

It is fundamental that the army commander must have complete control of his own supplies and maintenance resources. If the base depots or ports delivered supplies direct to each of the dispersed issue depots we have shown within the army area it would be administratively impossible for army to have knowledge of its supply resources. It is apparent that such a multiplicity of customers would seriously hamper the efficiency of base depots and would increase the order and delivery time and result in a large increase in the supply level required.

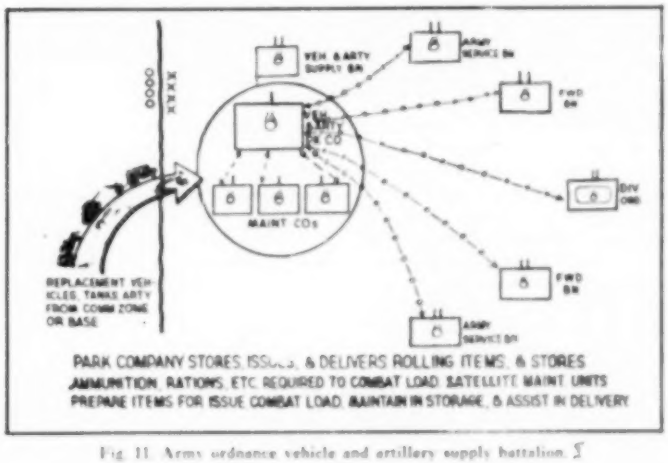
XXXX
VEH & ARTY SUPPLY BN
ARMY SERVICE BN
FWD BN
DIV ORD
MAINT COs
FWD BN
ARMY SERVICE BN
REPLACEMENT VEHICLES, TANKS ARTY FROM COMM ZONE OR BASE
PARK COMPANY STORES ISSUE & DELIVERS ROLLING ITEMS & STORES AMMUNITION, RATIONS, ETC REQUIRED TO COMBAT LOAD SATELLITE MAINT UNITS PREPARE ITEMS FOR ISSUE COMBAT LOAD, MAINTAIN IN STORAGE, & ASSIST IN DELIVERY

Fig. 11. Army ordnance vehicle and artillery supply battalion. Σ

Single Army Depot

The solution to this problem is simple. It lies in the creation and use of a single main army depot as the "port of entry" for the army. The solution is applicable to a task force of any size. If only one issue depot is used by the force, it becomes the "main depot" (Fig. 10). In type field army we use four field depot companies, and divide the ordnance catalogue on commodity lines in such a way as to impose an equal load on each company. Operation of the four companies as a battalion provides the centralized stock control required to forecast the ability to meet operational requirements.

Under this system we may now decentralize to this battalion commander a large part of the administrative responsibility of the supply system. The

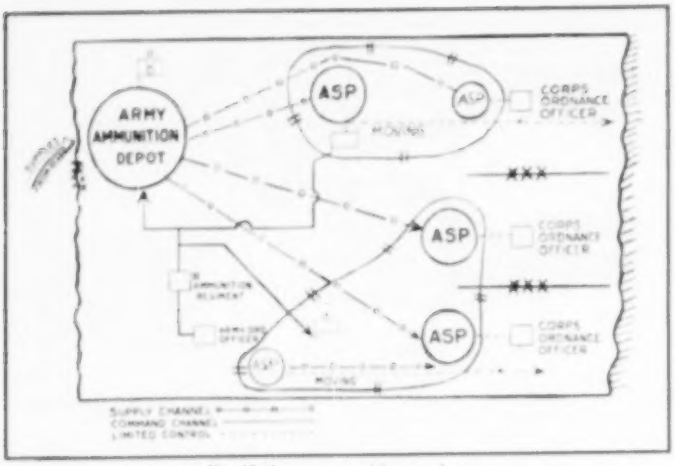

Fig. 13. Army ammunition service.

issues from the main depot represent the supply requirements of the whole force, and it is therefore logical that the stock records of this depot become the basis for the consolidated requisitions on base or theater for army needs.

Earlier you will remember the statement that we had found it impracticable to handle vehicles and similar major items in the ordinary depot channel. The problem of inspection, preparation, combat loading, and maintenance in storage of this type of material requires maintenance personnel and equipment. The addition of such personnel and equipment to depot units was found to be wasteful and inefficient in field operations. The problem is so different from that of handling spare parts and supplies as to require a separate solution.

We have therefore adopted the principle that vehicles, trailers, and towed artillery must be handled, stored, and distributed through maintenance channels. This also facilitated maintenance exchange, by far the most efficient method for maintaining equipment in use at nearly one hundred per cent efficiency.

For the same reasons outlined for the main depot, the receipt of this equipment, inspection, preparation, and initial distribution must be centralized. Standard maintenance companies were adapted and used during the war, but again with loss of efficiency in the utilization of man power and tools.

This problem is solved in the interim system by the employment in task forces larger than a single independent corps of the Vehicle and Artillery Park Company, which becomes the basic unit of a Vehicle and Artillery Supply Battalion, composed of several ordnance maintenance companies (Fig. 11).

The park company receives, stores, and issues rolling items coming forward from the base, stores the necessary small quantities of ammunition, rations, and similar nonordnance items which are required to make items ready for issue, and combat loads equipment prior to issue. The items are farmed out to the maintenance companies under battalion control for the actual mechanical processing.

Upon orders received from the army Ordnance officer, the battalion delivers this equipment to maintenance battalions throughout the army. We thus decentralize to this battalion the mission of the receipt, preparation, maintenance in storage, and physical distribution of major replacement rolling items.

It was also found that width and depth of the army area precluded the establishment of collecting points for each army area service battalion. In any case, a final clearing point is required to control evacuation from the army (Fig. 12). The solution is the establishment of an army collecting point in connection with a heavy army shop near the army rear boundary.

This area in the rear of the army service area includes the field shop battalion, the army depot battalion, and the artillery and vehicle park battalion, and is independent of any direct support of using units.

Ammunition Supply

The supply of ammunition is entirely independent of the supply and maintenance of other ordnance items. We therefore use a separate organization for this—an additional group for a field army. In a smaller force it might be a battalion mission (Fig. 13). As a standard operating procedure we supply the corps from ammunition supply points established and operated by the army.

The frequency of displacement in mobile situations is usually controlled by the availability of transportation. In very rapidly moving situations the points may fall quite far behind, but this lack of ready availability to troops is greatly compensated for by the vastly reduced expenditures of ammunition in a rapid advance. The objective is to keep ASP's within an 8-hour turnaround of tactical units being supplied.

The closest coordination is maintained with corps through the corps Ordnance officer, who is given copies of daily reports from the ASP serving his corps. Under normal conditions he is authorized to apply priorities of issue when required and as desired by the corps commander. The objective of the army is to maintain balanced stocks in the ASP, related to the weapons and tactical activity of the corps, in order to permit units to draw automatically the daily replacement of ammunition expended from basic loads. The refill principle is used throughout.

Ammunition expenditures are controlled within the army by rationing through command channels, the allowable rates being based upon firm forecasts of availability.

A main army ammunition depot is necessary to provide flexibility and to insure uninterrupted supply. In the type field army this is operated by an ammunition battalion, thus providing the two echelons of supply in depth that are essential to dependable and flexible operations.

The interim plan for ordnance service in the field is flexible and may be adopted to amphibious and airborne operations as the task force has the same responsibilities and basic organizational structure as the field army.

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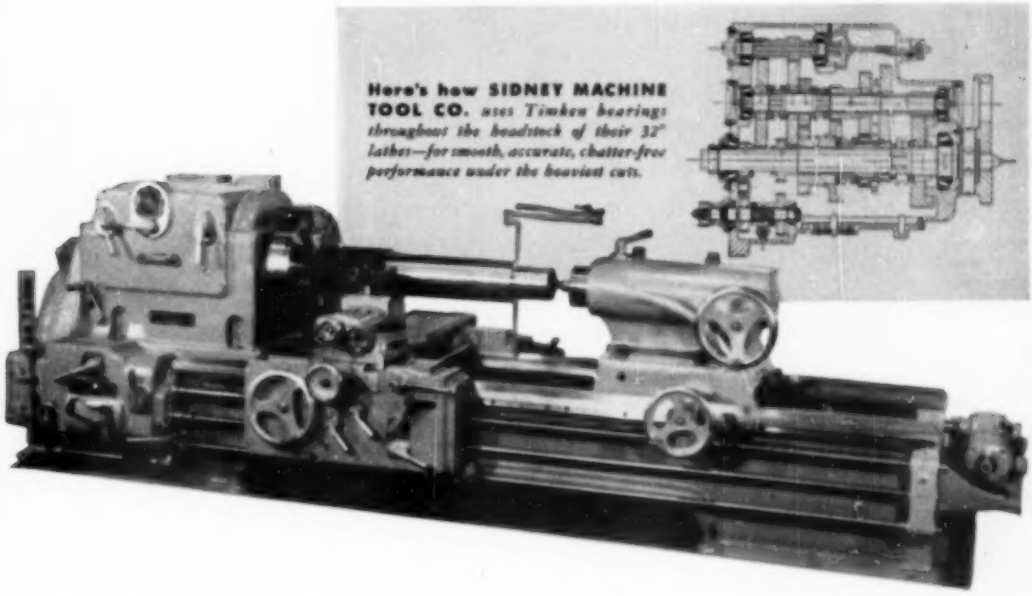

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